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Attitudinal, Normative, and Resource Factors Affecting Psychologists' Intentions to Adopt an Open Data Badge: An Empirical Analysis

Abstract

The purpose of this research is to investigate the attitudinal, normative, and resource factors affecting psychologists' adoption of an open data badge. The theory of planned behavior was employed to demonstrate how these factors influence behavioral intentions to adopt an open data badge. This research used a survey method to examine to what extent those attitudinal, normative, resource factors influence psychologists' behavioral intentions to adopt an open data badge, and therefore engage in data sharing behaviors. A national survey ($n = 341$) across the field of psychology showed that perceived benefit and perceived risk had significant positive and negative relationships with attitude toward the open data badge respectively. Furthermore, attitude toward open data badge and norm of data sharing had significant positive influences on psychologists' behavioral intentions to adopt the open data badge. Perceived effort had a significant negative relationship with the behavioral intention to adopt the open data badge, but had no effect toward attitudes surrounding the badge. However, this research found that the availability of a data repository and pressure from an open science journal did not have any significant relationship with behavioral intention to adopt the open data badge. The discussion includes implications for psychologists from both practical and theoretical perspectives. Additionally, future directions for gauging psychologists' adoption of the open data badge and increasing data sharing behaviors are discussed.

Keywords: Open data badge, data sharing, psychologist, psychology, theory of planned behavior

1. Introduction

Scientific data sharing has become an important aspect in advancing modern research activities. There are many reasons to encourage data sharing behaviors (King, 1995); for example, if data were available in a data repository, there would be an increase in transparency of the research method and process. Other scholars could build on the existing literature, rather than just replicating it, ultimately reducing costs and saving time involved in data collection. Data sharing would also allow researchers to confirm the findings of the original publication or to test different hypotheses. There is also potential for collaboration among scholars with similar research interests.

In 2014, the APA (American Psychological Association) journal, *Psychological Science*, introduced five significant changes to improve the way scholars report their research methods and results of a given study. One of these key changes included the promotion of open practices, which involves transparent communication from researchers about their scientific process. *Psychological Science* adopted an open data badge incentive program to acknowledge researchers' efforts to share their materials and/or data after a manuscript was set to be published. To earn these badges, researchers have to share data and/or materials digitally in an open access repository. Those who comply receive a badge on their published article for either sharing raw data, sharing materials used in the study, or both (Eich, 2014). In *Psychological Science* six months preceding the badges incentive being introduced, an average of 2.5% of articles contained open data (range: 1.5% - 4.0%) for the first and second halves of 2013. After the badges system was introduced, open data sharing practices increased significantly to 22.8% (range: 12.8% - 39.4%) from the first half of 2014 to the first half of 2015 (Kidwell et al., 2016).

Data sharing has been defined differently across disciplines. McCain (1995) explained data sharing in natural sciences as providing other researchers with reasonable access to their data or unique research materials that support published articles. Campbell and Bendavid (2003) defined data sharing in biological sciences as making research data or relevant materials associated with research articles either before or after publication. Kim and Stanton (2016) described data sharing in STEM disciplines as the extent in which scientists provide other scientists with access to their data of published articles either in a repository or upon request. For the purpose of this research, a psychologists' behavioral intention to adopt an open data badge, and therefore engage in data sharing behaviors, ought to be more clearly defined. Psychologists and social scientists are likely to engage in data sharing behaviors, either because of ethics codes (American Psychological Association, 2016) or standard social norms (Kim & Adler, 2015). For this particular context, data sharing is defined as psychologists' providing a raw dataset from a published work to a data repository in exchange for an open data badge for their publication.

This research utilizes the TPB (Theory of Planned Behavior) to better understand psychologists' behavioral intention to adopt the open data badge. The TPB is a widely known social psychology theory and was developed as a means to explain various aspects of human behavior across different situations (Ajzen, 1991; Fishbein & Ajzen, 1975). The TPB explains that an individual's behavior is influenced by his/her behavioral intention, which is determining whether an individual will adopt or engage in a behavior, is influenced by their attitude, subjective norm, and perceived behavioral control (i.e., resource) factors about a given behavior.

The attitude toward a behavior is affected by attitudinal beliefs, which refer to an individual's personal thoughts and opinions about the benefits and consequences regarding a particular behavior. Subjective norm is defined as an individual's perception of how others view a particular behavior. If performing or intending to conduct a particular behavior is widely accepted across different levels of people, s/he may be more likely to intend to perform the behavior. Lastly, perceived behavioral control (i.e., resource factor) refers to an individual's perception of being able to perform a particular behavior. This can include external behavioral control factor, such as an availability of resources to conduct a behavior, as well as internal behavioral control factor, like self-efficacy and effort expectancy.

The objective of the present study is to investigate the attitudinal, normative, and resource factors affecting psychologists' behavioral intentions to adopt an open data badge, through using a theoretical model based on TPB. By examining these factors under the lens of the TPB, we can gain a better understanding of the areas that predict behavior. Section two discusses the relevant literature to this study. Section three describes the research model and the justifications for the developed hypotheses. Section four describes the research method, including population sampling and demographics, as well as the procedures employed for data collection. In section five, the data analysis and results are presented. In section six, the study as a whole is discussed, including its practical and theoretical implications for psychologists and library professionals. This paper concludes by addressing the study's limitations and ways to build on this research through future studies.

2. Literature Review

Much of the literature discussing data sharing behaviors tends to generally focus on the hard sciences, with little emphasis on psychology, specifically. Many of these studies have identified individual, normative, and resource factors as a means to explore a researcher's relationship with data sharing or data withholding behaviors. First, there are several individual factors that influence a researcher's data sharing behavior, which include perceived benefits, perceived risks, and perceived effort. Previous studies have examined the perceived benefits of data sharing, including institutional recognition (Kankanhalli, Tan, & Wei, 2005), professional recognition (Kim, 2007), additional citations (Piwowar, Day, & Fridsma, 2007), and other academic rewards (Kling & Spector, 2003). Kidwell and colleagues (2016) suggest that offering badges after an article has been accepted for publication for those who complied with open data and/or materials practices can be perceived as an incentive to share data. Previous literature also examined perceived risks, which can prohibit data sharing; these risks include missing out on future publication opportunities (Campbell et al., 2002; Savage & Vickers, 2009), misuse of researcher's data (Borgman, Wallis, & Enyedy, 2007; Cragin, Palmer, Carlson, & Witt, 2010), and privacy-related concerns (Borgman, 2009; Savage & Vickers, 2009). The privacy-related concerns could especially apply to research that involves human subjects (Lane & Schur, 2010; Schwartz, Pappas, & Sandlow, 2010), such as the health profession and mental health fields. Perceived efforts involved in data sharing are also examined in the literature, and a good number of studies reported that when something takes too much effort (Campbell, et al., 2002; Louis et al., 2002), or there is not enough time or funding to organize the data (Tenopir et al., 2011), researchers are less likely to engage in data sharing behaviors.

Normative factors such as subjective norm and pressure by journals were found to have significant relationships with data sharing. Norms of data sharing differ across the social science disciplines (Freese, 2007). Kim and Adler (2015) found that overall, data sharing norms positively influence both attitudinal development and actual behavior among social scientists. When considering the field of psychology, examining the field's ethics code is important when determining set norms about data sharing within the profession. For example, in the American Psychological Association's (2016) code of ethics, section 8.14 states that psychologists "do not withhold the data on which their conclusions are based" and that psychologists requesting data to verify claims use data "only for the declared purpose" unless there is a "prior written agreement for all other uses of data." It is therefore expected that psychologists would be supportive of data sharing behaviors.

In addition, prior studies found that resource factors can impact the decision to engage in data sharing or data withholding behaviors. For example, when there is an availability of a data repository, researchers are more likely to contribute their data for others to use (Choudhury, 2008; Witt, 2008). Other resource factors that could impact data sharing behaviors include knowledge of metadata and its practices (Bietz, Baumer, & Lee, 2010) and whether a journal has data sharing requirements (McCain, 1995; Piwowar & Chapman, 2008). Later data sharing studies found that the availability of data repository has a significant positive influence on the data sharing behaviors of STEM researchers (Kim and Zhang, 2015) and health scientists (Kim and Kim, 2015). However, the availability of data repository was not found to have any significant influence on social scientists' data sharing behaviors (Kim & Adler, 2015).

Data sharing behaviors among psychologists have remained relatively stable over time, but are surprisingly low considering the APA's ethical code to share data when requested. Wolins (1962) wrote to 37 authors of major APA journals inquiring about their data from a published manuscript, and nine authors provided raw datasets, leaving a data sharing response rate of 24.3%. Similarly, Craig and Reese (1973) wrote to 53 authors of major APA journals and received 20 original datasets or summaries of data analyses, leaving a data sharing response rate of 37.7%. Additionally, Wicherts, Borsboom, Kats, and Molenaar (2006) wrote to 141 authors of major APA journals and received 38 responses with datasets upon request, leaving a data sharing response rate of 27.0%. Rates of data sharing "upon request" are often lower due to the perceived effort involved in preparing readable data for external researchers (Campbell et al., 2002; Kim & Adler, 2015; Kim & Stanton, 2016; Vickers, 2006). Other reasons authors are hesitant to share data upon request include protection of data for future publication opportunities (Campbell et al., 2002), limited resource factors such as organizational or technical barriers (Welch, Feeney, & Park, 2016), misinterpretation of research data (Vickers, 2006), and fear that other researchers may not reciprocate with data sharing (Louis, Jones, & Campbell, 2002).

Prior studies have provided insights that are invaluable to the data sharing literature, however, they are limited because they do not provide a detailed data sharing behavior model in a specific research discipline such as psychology, and the studies that focus on psychology did not always employ a theoretical framework to measure psychologists' data sharing behaviors or behavioral intentions. Previous literature about psychologists' data sharing behaviors also tends to look at the current status of data sharing in psychology, rather than what kinds of factors contribute the

current phenomena of data sharing practices in psychology. Therefore, this research examines psychologists' behavioral intentions toward adopting an open data badge under the theoretical framework of the TPB and by considering attitudinal, normative, and resources factors all together.

3. Research Model and Hypotheses Development

3.1 Research Model

The following research model provides an overall map of psychologists' adoption of an open data badge. This model is designed to facilitate an understanding of attitudinal, normative, and resource factors influencing the decision to adopt the open data badge. The TPB provides insight into how the attitudinal factors including attitudinal beliefs (i.e., perceived benefit, risk, and effort) and attitude, normative factors including norm of data sharing and pressure by open science journal, and resource factor including the availability of data repository impact a psychologist's decision to adopt the open data badge. Figure 1 shows the research model for psychologists' adoption of the open data badge.

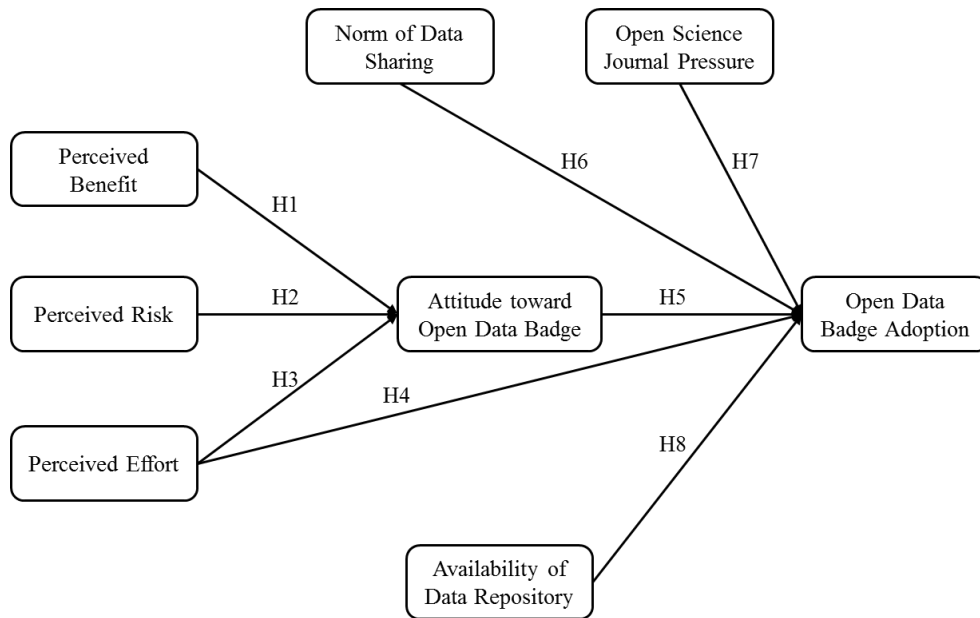


Figure 1. Research Model for Psychologists' Intentions to Adopt Open Data Badge

3.2 Hypotheses Development

This research investigates psychologists' behavioral intentions to adopt an open data badge on their published journal articles by considering attitudinal, normative, and resource factors based on the TPB. In terms of attitudinal factors, we examined whether perceived benefit, risk, and effort impact psychologists' attitude toward open data badge adoption, which leads to the intention to adopt an open data badge. With regards to normative factors, we investigated whether both subjective norm of data sharing and pressure by journals affect psychologists' intentions to adopt open data badges. Lastly, in terms of resource factors (i.e., perceived

behavioral controls), this research examined whether both internal behavioral control (i.e., perceived effort) and external behavioral control (i.e., the availability of data repository) factors have any significant relationships with psychologists' intentions to adopt open data badges. This research assumes that those three groups of factors including attitude, norm, and resource influence psychologists' behavioral intentions to adopt open data badges, which will eventually lead to their actual adoption behaviors of open data badges. The following section describes the research model and hypotheses based on the theoretical framework of TPB. Based on previous literature, we hypothesized that perceived benefit would positively influence psychologists' attitudes toward adopting the open data badge; conversely, perceived risk and perceived effort would negatively influence an attitude toward adopting the open data badge.

3.2.1 Perceived Benefit

Perceived benefit is defined as the degree to which a psychologist believes data sharing can provide academic rewards or opportunities, such as developing a more favorable reputation, gaining academic recognition, or an increase in being cited. Prior studies about data sharing have discovered that scholars and scientists expecting to gain these benefits will be positively influenced and hold a favorable attitude toward performing the behavior (Kankanhalli et al., 2005; Kim, 2007; Kling & Spector, 2003). This outcome was confirmed by Kim and Adler (2015) examining this phenomenon among social scientists. Therefore, it is expected that the perceived benefits of data sharing would encourage psychologists to have more favorable attitudes about the open data badge.

H1: Perceived benefit would positively affect a psychologist's attitude toward adoption of open data badge.

3.2.2 Perceived Risk

Perceived risk refers to the degree to which a psychologist believes data sharing can cause negative or adverse consequences, particularly as it concerns one's career. The perception of data sharing can be risky, not just for the researcher sharing data, but for participants of studies that may be about sensitive issues (Lane & Schur, 2010). Borgman (2009) found that data involving human subjects is less likely to be shared. Prior studies examining perceived risks in data sharing include the misuse of data (which could impact both research participants and psychologist) and missing out on future publication opportunities (Savage & Vickers, 2009; Tenopir et al., 2011). Therefore, it is expected that perceived risks of data sharing would discourage psychologists to adopt favorable attitudes toward the open data badge.

H2: Perceived risk would negatively affect a psychologist's attitude toward adoption of open data badge.

3.2.3 Perceived Effort

Perceived effort is defined as the degree to which a psychologist believes data sharing is worth committing time and energy. This includes the ease of providing a clean dataset that makes sense to researchers outside of that particular research lab (Campbell et al., 2002; Tenopir et al., 2011).

When time and effort involved to disperse a particular dataset increases, the perceived effort will negatively impact attitudes toward adopting the open data badge. Additionally, the perceived effort would also negatively influence a psychologists' behavioral intention to adopt the open data badge. Therefore, it is expected that effort would negatively affect both attitudes toward adopting the open data badge and intention to adopt the open data badge.

H3: Perceived effort would negatively affect a psychologist's attitude toward adoption of open data badge.

H4: Perceived effort would negatively affect a psychologist's intention to adopt open data badge.

3.2.4 Attitude toward Adoption of Open Data Badge

An attitude toward adoption of an open data badge refers to an individual's positive or negative views about data sharing behaviors, and it comprises the individual factors of perceived benefit, perceived risk, and perceived effort that were previously mentioned. According to the TPB (Ajzen, 1991; Fishbein & Ajzen, 1975), when someone holds positive attitudes about a particular behavior, it positively affects their intention to perform a behavior, and that intention subsequently leads to an individual actually performing a behavior. Psychologists are more likely to adopt the open data badge when they hold favorable views about data sharing, and therefore, it is expected that psychologists' attitudes toward adopting the open data badge will lead to a positive intention to adopt the open data badge.

H5: Psychologist's attitude toward adoption of open data badge would positively affect his/her intention to adopt open data badge.

3.2.5 Norm of Data Sharing

In this particular context, the norm of data sharing can be described as a combination of both subjective norms and normative influence. A subjective norm is the perceived social pressure to perform a particular behavior from close colleagues (Ajzen, 1991; Fishbein & Ajzen, 1975), whereas normative influence is the perceived social pressure to perform a particular behavior from the ascribed discipline (i.e., psychology) as a whole. Prior studies examining data and knowledge sharing behaviors indicate that norms have a significant impact on behavioral intention (Bock, Zmud, Ki, & Lee, 2005; Chow & Chan, 2008). This effect was also present among social scientists (Kim & Adler, 2015), and thus, norms of data sharing will positively affect a psychologist's behavioral intention to adopt the open data badge.

H6: Norm of data sharing would positively affect a psychologist's intention to adopt open data badge.

3.2.6 Open Science Journal Pressure

Open science journal pressure occurs when editors and publishers of particular journals use regulative pressure to persuade authors submitting an article for publication to also share their data in a data repository. Because journal publishers have the ability to determine whether an

article will actually be published, psychologists may be more likely to share their data and adopt the open data badge with the Open Science journals as a result of their article's publication. Previous research confirms that compliance with the pressure applied by a journal to share data directly influences an individual's behavioral intention to share data (Liu, Ke, Wei, Gu, & Chen, 2010). Therefore, this research predicts that regulative pressures applied by Open Science journals would positively affect a psychologist's intention to adopt the open data badge.

H7: Open science journal pressure would positively affect a psychologist's intention to adopt open data badge.

3.2.7 Availability of Data Repository

The availability of a data repository can impact whether a psychologist intends to engage in data sharing and eventually adopt the open data badge. Control beliefs and perceived behavioral control elements described in the TPB (Ajzen, 1991; Fishbein & Ajzen, 1975) note that when there is a presence of resources with relatively few obstacles, an individual is more likely to intend to perform a behavior. Prior studies indicate that repositories can facilitate data and knowledge sharing behaviors (So & Bolloju, 2005; Yang & Chen, 2007; Kim & Burns, 2015). Therefore, this research assumes that the accessibility of data repositories can encourage psychologists to adopt the open data badge.

H8: Availability of data repository would positively affect a psychologist's intention to adopt open data badge.

This model examines attitudinal factors such as the perceived benefits, risks, and efforts to engage in data sharing behaviors. Additionally, this model examines normative factors of data sharing behaviors within the discipline of psychology. Finally, this model examines the resource factors that could impact a psychologists' decision to adopt an open data badge, such as the availability of data repositories or whether there is pressure from an open science journal. In summary, the proposed research model provides an overall map of factors influencing psychologists' adoption of an open data badge

4. Research Method

4.1 Population and Sampling

The target population of this study is the psychology researchers in U.S. research institutions. This research utilized the Community of Scientists (CoS) Scholar Database for its sampling frame. According to the CoS scholar database, there are 42,016 psychologists in the discipline of psychology categorized by the CoS (as of October 31, 2016). We randomly selected a total of 3,000 psychologists from the CoS scholar database, and a total of 2,919 potential survey participants were identified with emails. 81 people were removed because they do not have any email addresses to contact. Then, we sent out emails to those 2,919 potential survey participants in order to recruit the survey participants for this research.

4.2 Measurement of Constructs

A total of 23 survey items were used to measure 8 research constructs for this study. The majority of measurement items were borrowed from Kim and Zhang's (2015) data sharing study with STEM (Science, Technology, Engineering, and Mathematics) disciplines, and they are modified for psychologists' data sharing and open data badge adoption contexts. This research employed 5-point Likert scales ranging from "Strongly Disagree", "Disagree", "Neither Disagree nor Agree", "Agree", and "Strongly Agree" for the most of items measuring psychologists' diverse perceptions toward data sharing and open data badge adoption. Each construct was measured with multiple items. The measurement items for research constructs can be found in Appendix A.

4.3 Data Collection Procedure and Result

The survey was initially distributed to 2,919 potential participants through Qualtrics, an online survey management software. The first message was sent out on November 7, 2016. Three reminders were sent out on November 21 and December 19, 2016, and January 31, 2017 (the final reminder) – we sent out those reminders in order to increase the response rate of this survey. The survey was closed on February 15, 2017. Through the four message distributions, 337 emails were bounced due to incorrect emails and spam filters, and only 2,582 potential participants actually received the messages with the survey link included in the messages. We initially received a total of 557 partial and full responses. Among those 557 initial responses, we removed any responses which have more than 10% of missing values, and this leads to a total of 397 valid responses (response rate: $15.38\% = 397 / (2,919 - 337)$). Since this research only focuses on psychologists, we excluded any responses from other disciplines such as biological sciences and general social sciences (i.e., 56 responses from disciplines other than psychology). Therefore, a total of 341 responses from only psychologists were used for the final data analysis.

4.4 Demographics of the Respondents

The survey respondents' demographic information covers gender, age, tenure status, and position. Among the 341 respondents, there were 159 male respondents (46.6%) and 174 female respondents (51.0%), while 8 respondents (2.4%) did not indicate their gender. For age, the respondents are from diverse age groups ranging 25-34 (34, 10.0%), 35-44 (120, 35.2%), 45-54 (81, 23.8%), 55-64 (58, 17.0%), and 65 or more (38, 11.1%), while 10 respondents (3.0%) did not indicate their ages. For tenure status, the most of respondents are tenured (247, 72.4%), and other respondents are on tenure track (71, 20.8%), not on tenure track (12, 3.5%), and retired (5, 1.5%), while 6 respondents (1.8%) did not specify their tenure status. For position, the respondents were listed as full professor (135, 39.6%), associate professor (111, 32.6%), assistant professor (76, 22.3%), professor of emeritus (5, 1.5%), researcher (4, 1.2%). The demographic information of respondents is presented in Table 1.

	Demographic Category	Number	Percentage (%)
Gender	Male	159	46.6
	Female	174	51.0
	<i>Prefer Not to Answer</i>	4	1.2
	<i>Missing</i>	4	1.2

Age	25-34	34	10.0
	35-44	120	35.2
	45-54	81	23.8
	55-64	58	17.0
	65+	38	11.1
	<i>Prefer Not to Answer</i>	7	2.1
	<i>Missing</i>	3	0.9
Status	Tenured	247	72.4
	On Tenure Track	71	20.8
	Not On Tenure Track	12	3.5
	Retired	5	1.5
	<i>Prefer Not to Answer</i>	4	1.2
	<i>Missing</i>	2	0.6
Position	Assistant Professor	76	22.3
	Associate Professor	111	32.6
	Full Professor	135	39.6
	Professor Emeritus	5	1.5
	Researcher	4	1.2
	Other	3	0.9
	<i>Prefer Not to Answer</i>	5	1.5
	<i>Missing</i>	2	0.6
Total		341	100

Table 1. Demographics of Survey Participants

The 341 survey participants belong to the discipline of psychology as categorized by the NSF (National Science Foundation). They are from clinical psychology (58, 17.0%), non-clinical psychology (84, 24.6%), combined psychology (53, 15.5%), and other psychology disciplines (146, 42.8%).

5. Data Analysis and Results

This study used a Structural Equation Modeling (SEM) approach to evaluate the hypothesized relationships in the psychologists' open data badge adoption model. This research chose a component-based SEM based on partial least squares other than a covariance-based SEM since this study is exploratory not focusing on confirmatory (Bontis, Crossan, & Hulland, 2002). Since this research chose to use the Partial Least Squares-Structural Equation Modeling (PLS-SEM) approach, we did not calculate the model fit for this research. SmartPLS 2.0, PLS-SEM software, was employed for data analysis (Ringle, Wende, & Will, 2005), and the two-stage approach evaluating measurement model and structural model consequently was used (Hair, Black, Babin, Anderson, & Tatham, 2006). A measurement model was evaluated to examine the reliability and validity of measurement items for each research construct, and then a structural model was assessed to investigate the hypothesized relationships among the research constructs by using partial least square method.

5.1 Measurement Model

The measurement model was evaluated to ensure the reliability and validity of research constructs. The reliability of measurement items was ensured by examining Cronbach's alpha and Composite Reliability (CR). Cronbach's alpha values for multi-item constructs range from 0.78 (open science journal pressure) to 0.98 (intention to adopt open data badge), and the Cronbach's alpha values are more than the acceptable value of 0.70 (Chin, 1998; Nunnally & Bernstein, 1994). The CR values for multi-item constructs range from 0.87 (norm of data sharing) to 0.99 (intention to adopt open data badge), and the CR values are also more than the recommended value of 0.70 (Chin, 1998; Nunnally & Bernstein, 1994). Both Cronbach's alpha and CR values in this research suggest satisfactory reliability of the measurement scales for each research construct. Validity of constructs was evaluated by examining both CR and Average Variance Extracted (AVE) values. The CR values are more than the recommended value of 0.70. The AVE values range from 0.70 (norm of data sharing) to 0.96 (intention to adopt open data badge), and those AVE values are all greater than the recommended value of 0.50 (Fornell & Larcker, 1981; Hair et al., 2006). The CR and AVE values suggest that the research constructs in this study are valid for estimating the structural model. The Cronbach's alpha, CR, and AVE values are shown in Table 2.

Variables	Cronbach's α	CR	AVE
Perceived Benefit	0.94	0.96	0.90
Perceived Risk	0.83	0.90	0.74
Perceived Effort	0.82	0.88	0.71
Attitude toward Badge Adoption	0.89	0.93	0.82
Norm of Data Sharing	0.79	0.87	0.70
Open Science Journal Pressure	0.78	0.88	0.71
Availability of Data Repository	0.87	0.94	0.89
Intention to Adopt Badge	0.98	0.99	0.96

Table 2. Reliability and Validity Values

Once the measurement items were evaluated for reliability and validity of constructs, the measurement model was also evaluated to warrant the convergent and discriminant validity of the research constructs (Chin, 1998; Fornell & Larcker, 1981). The square roots of each construct's AVEs (the bold-face fonts in Table 3) are larger than the correlations between constructs (the regular-face fonts in Table 3). This shows reliable convergent and discriminant validity of research constructs (Chin, 1998; Fornell & Larcker, 1981). The evaluation of the measurement model represents that the measurements for constructs for this research are reliable and valid for structural model evaluation. The square roots of AVEs and correlation matrix are shown in Table 3.

	Perceived Benefit	Perceived Risk	Perceived Effort	Attitude toward Badge Adoption	Norm of Data Sharing	Open Science Journal Pressure	Availability of Data Repository	Intention to Adopt Badge
Perceived Benefit	0.95							
Perceived Risk	-0.21	0.86						
Perceived Effort	-0.18	0.28	0.85					
Attitude toward Badge Adoption	0.41	-0.29	-0.19	0.91				
Norm of Data Sharing	0.43	-0.19	-0.13	0.36	0.84			
Open Science Journal Pressure	0.18	0.02	0.01	0.08	0.25	0.84		
Availability of Data Repository	0.24	-0.09	-0.12	0.11	0.24	-0.03	0.94	
Intention to Adopt Badge	0.36	-0.33	-0.34	0.54	0.39	0.08	0.18	0.98

Table 3. Square Roots of AVEs and Correlation Matrix

Convergent and discriminant validities were also assessed by using principal component factor analysis with Varimax rotation. Each item is loaded on its designated factors with a lowest loading value of 0.640, which is larger than the acceptable value of 0.40 (Field, 2009), and no item is loaded on more than two constructs with cross-loading value beyond 0.279, which is smaller than the acceptable value of 0.40 (Field, 2009). This shows acceptable convergent and discriminant validity. Table 4 shows the results of principal component factor analysis based on Varimax rotation with Eigenvalue and variance explained.

Factors	Items	Component							
		1	2	3	4	5	6	7	8
Perceived Benefit	Benefit1	.151	.880	.098	-.116	-.051	.047	.202	.079
	Benefit2	.106	.917	.177	-.035	-.024	.070	.165	.087
	Benefit3	.113	.889	.210	-.091	-.057	.094	.179	.099
Perceived Risk	Risk1	-.154	-.074	-.079	.821	.069	-.015	-.078	-.071
	Risk2	-.104	-.024	-.112	.880	.078	.005	-.036	-.104
	Risk3	-.096	-.109	-.114	.799	.146	.028	-.080	.064
Perceived Effort	Effort1	-.101	-.028	-.078	.099	.881	.013	-.013	-.060
	Effort2	.065	-.032	-.038	.035	.890	.078	.027	.048
	Effort3	-.264	-.057	.022	.179	.773	.027	-.108	-.041
Attitude toward Badge	Attitude1	.279	.197	.855	-.061	-.011	.022	.138	.017
	Attitude2	.238	.209	.863	-.158	-.015	-.017	.107	.034
	Attitude3	.202	.094	.834	-.137	-.085	.057	.045	.026
Norm of Data Sharing	Norm1	.272	.112	.082	-.109	.023	.112	.788	.049
	Norm2	.132	.203	.139	.004	-.018	.151	.794	.068
	Norm3	-.010	.194	.045	-.104	-.083	.061	.780	.141
Open Journal Pressure	Journal1	-.070	.080	.196	-.041	.068	.640	.066	.063
	Journal2	.079	.070	-.081	.025	.042	.920	.102	-.063
	Journal3	.091	.021	-.065	.039	.001	.903	.114	-.056
Data Repository	Repository1	.090	.101	-.007	-.056	.071	-.034	.096	.927
	Repository2	.045	.114	.069	-.046	-.117	-.014	.133	.916
Intention to Adopt Badge	Intention1	.893	.131	.258	-.145	-.122	.043	.147	.060
	Intention2	.910	.129	.261	-.142	-.103	.033	.147	.075
	Intention3	.898	.143	.258	-.165	-.093	.038	.124	.049
Eigenvalue		2.90	2.70	2.58	2.30	2.28	2.14	2.13	1.80
Variance Explained		12.62	11.74	11.22	10.01	9.91	9.32	9.27	7.83
Cumulative Variance		12.62	24.36	35.58	45.58	55.49	64.81	74.09	81.92

*Factor loadings of 0.40 and above are marked in bold.

Table 4. Results of Principal Component Factor Analysis with Varimax Rotation

5.2 Structural Model

After assessing the measurement model, the structural model was evaluated to investigate the hypothesized relationships among constructs. The PLS-SEM was employed to evaluate the structural model of psychologists' adoption of open data badge. The results can present how psychologists' perceptions toward data sharing (i.e., perceived benefit, risk, and effort), attitude toward open data badge, norm of data sharing, open science journal pressure, and availability of data repository all influence psychologists' adoption of open data badge. Figure 2 presents the results of the structural model evaluation.

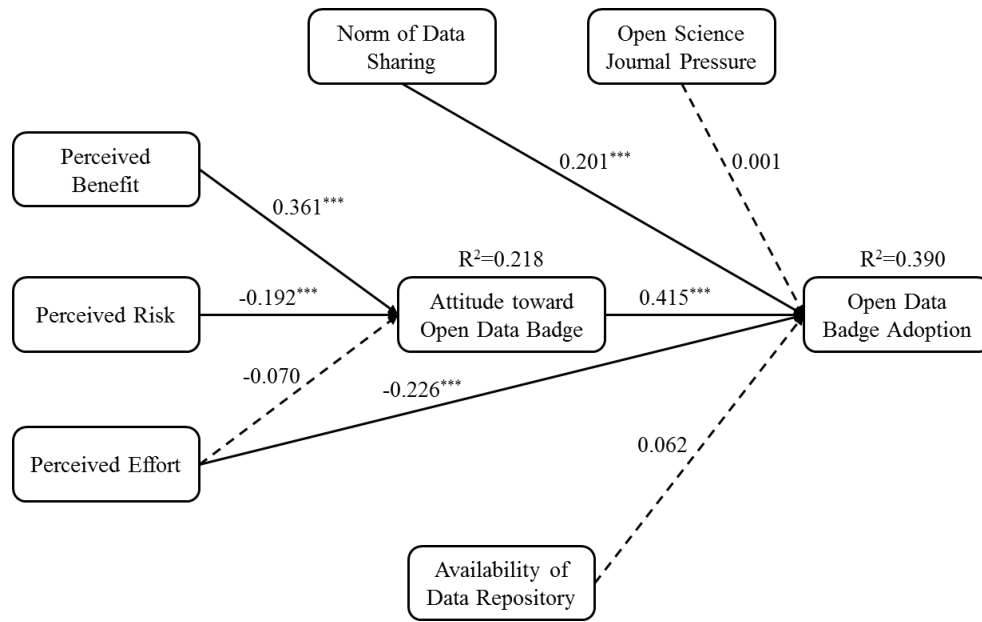


Figure 2. Hypothesis Testing Results based on Psychologists' Open Data Badge Adoption Model (** $p < 0.001$)

In terms of attitudinal belief factors, perceived benefit ($\beta = 0.361$, $p < 0.001$) and perceived risk ($\beta = -0.192$, $p < 0.001$) were detected to have statistically significant relationships with psychologists' attitude toward adoption of an open data badge in positive and negative directions respectively. Perceived effort, however, was not found to have a significant relationship with psychologists' attitude toward adoption of an open data badge ($\beta = -0.070$, $p > 0.05$). The attitude toward adoption of an open data badge was explained by perceived benefit and risk in data sharing, and the total variance explained by those two factors is 21.8% ($R^2 = 0.218$).

The attitude toward adoption of an open data badge ($\beta = 0.415$, $p < 0.001$) and norm of data sharing ($\beta = 0.201$, $p < 0.001$) were found to have significant positive influences on intention to adopt an open data badge. Also, perceived effort involved in data sharing was found to have a significant negative influence on intention to adopt open data badge ($\beta = -0.226$, $p < 0.001$). However, both open science journal pressure ($\beta = 0.001$, $p > 0.05$) and availability of a data repository ($\beta = 0.062$, $p > 0.05$) were not found to have any significant relationships with intention to adopt an open data badge. Psychologists' intention to adopt open data badge is explained by attitude toward adoption of open data badge, norm of data sharing, and perceived effort, and the total variance explained by those three factors is 39.0% ($R^2 = 0.390$). Table 5 shows the results of hypothesis testing.

Hs	Statements	Result	Beta (p)
H1	Perceived benefit would positively affect a psychologist's attitude toward adoption of open data badge.	Supported	.361***
H2	Perceived risk would negatively affect a psychologist's attitude toward adoption of open data badge.	Supported	-.192***

H3	Perceived effort would negatively affect a psychologist's attitude toward adoption of open data badge.	Not Supported	-.070
H4	Perceived effort would negatively affect a psychologist's intention to adopt open data badge.	Supported	-.226***
H5	Psychologist's attitude toward adoption of open data badge would positively affect his/her intention to adopt open data badge.	Supported	.415***
H6	Norm of data sharing would positively affect a psychologist's intention to adopt open data badge.	Supported	-.201***
H7	Open science journal pressure would positively affect a psychologist's intention to adopt open data badge.	Not Supported	.001
H8	Availability of data repository would positively affect a psychologist's intention to adopt open data badge.	Not Supported	.062

Table 5. Summary of Hypothesis Testing Results (**p<0.001)

6. Discussion

By implementing the TPB (Ajzen, 1991; Fishbein & Ajzen, 1975), this research investigates how attitudinal, normative, and resource factors affect psychologists' behavioral intentions to adopt an open data badge. This study confirmed that psychologists' attitudes toward adopting an open data badge is driven by personal motivations including perceived benefit and risk of data sharing. Although perceived benefit positively impacts a psychologist's attitude toward the open data badge, perceived risk negatively impacts a psychologist's attitude toward the open data badge. Perceived effort did not influence a psychologist's attitude toward the open data badge, but it did negatively affect behavioral intention to adopt the open data badge directly.

In order to facilitate a more positive attitude toward the adoption of the open data badge, emphasizing the perceived benefits and reducing the perceived risks ought to occur. First, in order to facilitate positive attitude toward open data badge adoption, benefits of data sharing need to be promoted in the community of psychology. Psychologists ought to be aware that sharing data can lead to academic recognition and additional citations (Kankanhalli et al., 2005; Kim, 2007; Kling & Spector, 2003), and there is also the added potential for future collaboration with other psychologists or researchers because of that shared dataset. Additionally, by reducing the risk perception of data sharing and adopting the open data badge, more favorable attitudes surrounding data sharing and adopting open data badges can be formed. For example, instead of looking at sharing data as potentially missing a research opportunity, reframe it as allowing another researcher to build on the existing literature and for potential future collaboration. If scholars are able to reframe some of the potential risks as benefits, data sharing and open data badge adoption trends may increase.

Social scientists tend to conform to norms as a means of maintaining their legitimacy in their respective fields (John, Cannon, & Pouder, 2001; Zsidisin, Melnyk, & Ragatz, 2005). In the case of adopting the open data and materials badges, psychologists can see how many other researchers have done the work to earn the badges thus far. Our study indicates that psychologists are positively influenced by norms of data sharing, which means that the more a researcher thinks others are in support of or are already performing a particular behavior, the more likely they themselves intend to perform that same behavior. In order to develop a positive

norm of data sharing among psychologists, associations such as the APA can disseminate educational materials about diverse data sharing practices to the associations' members.

Perceived effort was found to negatively impact a psychologist's behavioral intention to adopt the open data badge, which confirms prior literature about data sharing behaviors decreasing as effort increases (Louis, Jones, & Campbell, 2002; Tenopir et al., 2011). By reducing the effort expectancy, this could mitigate some of the negative feelings associated with data sharing behaviors and increase the likelihood that a psychologist will intend to adopt the open data badge in the future. To reduce the effort expectancy, psychologists can opt to clean the data properly the first time around so that members outside the research lab can understand what the data relays. It is important for the community of psychologists to develop data management protocols ranging from data collection, organization, analysis, and sharing, which can relieve psychologists' efforts involved in managing their data. Eventually, the data management protocols can better facilitate their data sharing and adoption of open data badge. In addition, academic libraries can be used to provide data management services for their researchers throughout the data life cycle. Libraries and librarians have their systems and expertise to support their researchers' data management by education and with resources.

The availability of data repositories did not impact whether a psychologist decides to adopt an open data badge. This could be the result of a lack of repositories generally available to the psychology discipline, or it could be because psychologists and other social scientists are generally more likely to engage in personal data sharing behaviors (Kim & Adler, 2015), regardless of the presence of an incentive like the open data badge.

Additionally, pressure from open science journals did not impact a psychologist's decision to participate in adopting an open data badge. This is likely because the pressure coming from journals for researchers to share data with a publication is optional, not mandatory. In the journals which implemented open data badge practices, only accepted manuscripts are eligible to apply for data sharing badges (Association for Psychological Science, 2014), and therefore, regulative pressure from the journal to share data and materials in exchange for a publication is not present. Rather than psychologists sharing data and earning the badge in exchange for publication, they are sharing the data because they believe in transparent, good quality research.

This research has several practical implications for the research community within psychology as well as for library professionals. The results of this study indicate that norms of data sharing positively influence psychologists' behavioral intentions to adopt an open data badge. Through fostering open communication within the research community about decreasing the perceived risks and increasing the perceived benefits of data sharing, psychologists can begin working collectively to make strides toward more transparent research within the profession. Leaders in the psychology community (e.g. American Psychological Association), journal publishers, and research institutions ought to work together to implement reward systems for data sharing so that open data practices can eventually become normative in their research community. Additionally, it is important to lower the risks associated with data sharing by allowing researchers to have an embargo period for data sharing or the exclusive right to publish for a certain time-frame after the data was collected. This can be done by developing data sharing policies and guidelines in the entire research data life-cycle and promoting those policies through educational curriculums,

research workshops, and publication procedures. By normalizing conversations about data sharing, we can expect to see higher involvement with data sharing practices.

Perceived risks and perceived effort involved within data sharing practices negatively affects behavioral intentions to adopt the open data badge and therefore engage in data sharing behaviors. Academic libraries that offer data services ought to consider ways that they can reduce risk and effort expectancies of researchers and assist them with organizing and managing data. Borgman (2009) found that data that involves human subjects is less likely to be shared due to the sensitive nature of psychologists' research. Academic libraries and psychologists can work together to ensure confidentiality and privacy concerns are alleviated and both risk and effort expectancies are reduced. Furthermore, it is important to create reliable data sharing protocols and standardized methods (e.g., metadata standards) for psychologists to easily organize their research data and share them with others by depositing data into institutional repositories. Libraries and librarians have their resources and expertise to support psychologists' data management and sharing, so academic libraries ought to utilize their infrastructural and human resources for facilitating their researchers' data sharing and reuse.

7. Limitations and Future Research

This study investigated factors affecting psychologists' adoption of an open data badge using a theoretical lens of TPB. Although we conducted this empirical study carefully in the research procedure, this research is limited in terms of methodology. We utilized a survey as a main data collection method, but the survey did not provide any in-depth contexts involved in psychologists' adoption of an open data badge. Also, this research only captured psychologists' intentions to adopt an open data badge rather than their actual behaviors. Lastly, psychologists' data sharing behaviors are affected by IRB (Institutional Review Board) requirements to protect human subjects, but this research did not consider the different types of research data involving human subjects and their IRB requirements.

Although this research provides an overview of psychologists' behavioral intentions to adopt an open data badge, future research needs to be done to further examine psychologists' actual adoption behavior of an open data badge by considering other relevant factors in data sharing and open data badge adoption. Future research can target journals with similar badge programs to determine factors that influenced the researcher's behavioral decision to either adopt the badge or not adopt the badge based on the actual data about open data badge adoption in those journals. In addition, the data sharing policy of open science journals can be considered as incentives rather than regulations. The Transparency and Openness Promotion (TOP) Committee met in 2014 to address journals' implemented procedures for publishing standards. These standards aim to change the current incentive structure to increase open science practices and to "increase scientific norms and values into concrete actions" (TOP Guidelines Committee, 2015, p. 2). Therefore, future research can consider a new research construct for open science journals' incentive structures and test its effect on researchers' data sharing behaviors. Furthermore, it is important to investigate psychologists' adoption of an open data badge by considering the characteristics of research data and IRB requirements related to those data. Considering in-depth interviews, focus groups, or open-ended questions in future surveys can help paint a more

holistic picture of psychologists' decisions to adopt an open data badge or to engage in data sharing behaviors.

Appendix

Appendix A. Measurement Items for Research Constructs

Construct	Items	Sources
Perceived Benefit	<ul style="list-style-type: none"> • I can earn academic credit such as more citations by sharing data. • Data sharing would enhance my academic recognition. • Data sharing would improve my status in a research community. 	(Bock et al., 2005; Wasko et al., 2000)
Perceived Risk	<ul style="list-style-type: none"> • There is a high probability of losing publication opportunities if I share data. • Data sharing may cause my research ideas to be stolen by other researchers. • My shared data may be misused or misinterpreted by other researchers. 	(Featherman et al., 2003; Pavlou 2003)
Perceived Effort	<ul style="list-style-type: none"> • Sharing data involves too much time for me (e.g. to organize/annotate). • I need to make a significant effort to share data. • I would find data sharing difficult to do. 	(Davis 1989; Thompson et al., 1991)
Attitude toward Badge Adoption	<ul style="list-style-type: none"> • Having the open data badge on my publication is valuable. • Having the open data badge on my publication is desirable. • Having the open data badge on my publication is pleasant. 	(Ajzen & Fishbein, 2005; Tohidinia & Mosakhani, 2010)
Norm of Data Sharing	<ul style="list-style-type: none"> • It is expected that researchers would share data. • Researchers care a great deal about data sharing. • Many researchers are currently participating in data sharing. 	(Ajzen & Fishbein, 2005; Kostova & Roth, 2002)
Open Science Journal Pressure	<ul style="list-style-type: none"> • The open science journal expects me to share this data. • The open science journal requires me to share this data. • The open science journal enforce me to share this data. 	(Kostova et al., 2002; Teo et al., 2003)
Availability of Data Repository	<ul style="list-style-type: none"> • Data repositories are available for researchers to share data. • Researchers have the data repositories necessary to share data. 	(Thompson et al., 1991; Venkatesh et al., 2003)
Intention to Adopt Open Data Badge	<ul style="list-style-type: none"> • I am likely to share this data and have the open data badge on my publication. • I intend to share this data and have the open data badge on my publication. • I will try to share this data and have the open data badge on my publication. 	(Ajzen & Fishbein, 2005; Tohidinia & Mosakhani, 2010)

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