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Network analysis among *World of Warcraft* players' social support variables: A two-way approach

ABSTRACT

World of Warcraft (WoW) *is one of the most popular massively multiplayer online games. Previous studies have found evidence of in-game and offline social support among* WoW *players; however, the interplay of different types of social support such as informational and emotional support among this cohort has not been examined. This study used a reciprocal social support perspective to explore the system-level relationships among different types of social support in a sample of* WoW *players* (N=*181). Using network analysis, two major types*

KEYWORDS

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guild membership
informational support
emotional support

of social support, informational and emotional, given and received within WoW *and offline systems were included as model indicators. Social support networks of guild and non-guild members were compared. Clear separation was found between offline and in-game social support. Informational support played a key role in all networks but differences in the social support networks were identified between guild and non-guild members. These findings indicate dynamics between different types of social support overlooked in previous studies. By revealing such dynamics, network analysis has been shown as a promising tool for evidencing the subtle dynamics between distinct constructs.*

INTRODUCTION

The several million daily players of massively multiplayer online games (MMOGs) are part of game-specific cyber communities in which they can provide and receive social support. MMOG playing is often a highly social experience (de Larios and Lang 2014). While the number of *World of Warcraft* (*WoW*) subscribers has decreased due to competition from a plethora of new games (Statista 2019), the time investment and skill level required and the strong teamwork that exists within *WoW* makes it an excellent platform to research the subtle dynamics of socializations and teamwork within online gaming communities (Castronova 2006). Given the associations between online social engagement and mental health evidenced in the research (Longman et al. 2009; Costa et al. 2018), it is important to elucidate the interplay of different facets of social support experienced by gamers.

In-game social support

Individuals can obtain and share information expressing care, esteem and belongingness from their involvement with online games such as *WoW* (Duchenaut et al. 2006; Trepte et al. 2012; Kaye and Bryce 2012). Such information is clearly linked to social support (Cobb 1976). Social support theory posits that support consists of both 'structural' and 'functional' dimensions (Cohen and Wills 1985; Cohen 2004), which can be translated in the online gaming environment. Structural support focuses on the size and strength of an individual's network (e.g. size, nature of relationship), whereas functional support focus on the nature of the support. The research has indicated a wide range of types of functional support, however most of these can be encompassed by the categories of emotional (empathy, concern, encouragements) and instrumental (tangible, practical deeds) (Shakespeare-Finch and Obst 2011; Semmer et al. 2008). The effects of both giving and receiving these types of social support have been investigated across a variety of populations and outcomes. Earlier research in this field focused on reciprocity through the quality of social exchanges rather than the effect of giving and receiving distinct types of support independently (Brown et al. 2003). Research that has focused on distinct social support processes has found that giving social support can have greater beneficial effects than receiving social support alone across a range of outcomes (Steffens et al. 2016; Thomas 2010), including self-esteem and quality of life (Warner et al. 2010). Research conducted in online contexts also indicates that giving and receiving different types of social support can support different outcomes (Liu et al. 2017). In the gaming literature research has demonstrated that social support can be exchanged in MMOG environments

(Longman et al. 2009). Specific to *WoW*, previous research has found that social support can be derived in game while playing *WoW* (Longman et al. 2009; O'Connor et al. 2015; Cole and Griffiths 2007). The game mechanics of *WoW* facilitate such exchanges, as players can work collectively in-game guilds to achieve in-game tasks (Williams et al. 2006). Specifically, receiving and providing practical in-game assistance (help) and gaming knowledge (advice) are two major forms of informational support (O'Connor et al. 2015). Social interactions among *WoW* players have also been shown to extend to the offline realm, with emotional advice regarding personal issues and connecting in offline activities reported by *WoW* players (O'Connor et al. 2015). Research has not explored social support in the context of gaming regarding network, reciprocity of both giving and receiving support, support type or the potential extension of in-game support into the offline context.

Previous research into online social support has not focused on the system-level relationships among different types of social support, but rather at simply comparing levels of social support (Malecki and Demaray 2003; Eriksson and Lauri 2000). The complex interplay between giving and receiving emotional and informational support has not yet been examined in the context of online gaming communities. In particular, a cross-realm (online, offline) investigation of this context would add to the current understanding of how social support is experienced through online social interactions and may intersect with offline interactions (Dupuis and Ramsey 2011). Measures of both online and offline social support have tended to be used separately in previous *WoW* studies (Longman et al. 2009), although qualitative findings suggest that such interactions tend be interwoven across online and offline social experiences (O'Connor et al. 2015; Williams et al. 2006; Trepte et al. 2012).

Network analysis

Network analysis has a relatively long history (Freeman 1978), but the application in psychology is a nascent interest. Thus far, network analysis has been mainly used in personality (Costantini and Perugini 2016) and biopsychosocial investigations (Thompson et al. 2018). As a statistic with both visualization and indices, a network perspective for social psychology could provide a useful methodological approach to explore the complex relationships among constructs. A small number of studies have successfully applied network analysis to explore online socializations (Wallner et al. 2019; Szell and Thurner 2010) but to date there is no research that has focused on the interplay of social interactions between online and offline domains using a psychological lens. The current research focused on exploring the experience of social support by online game players, specifically conceptualized as an integral phenomenon with reciprocal interactions from different sources. Unlike conventional statistics, network analysis can be used to explore complex and complete systems even in small samples (Hevey 2018).

Research questions

This study aimed to explore the overall structural organization of giving and receiving experience of social support by *WoW* players both online and offline using an inter-correlated perspective. This is a novel approach as previous research has regarded social support as a unidimensional variable (e.g. Domahidi et al. 2018) with the assumption that social support functions separately in-game and offline (e.g. Longman et al. 2009), thereby ignoring the

subtle differences between receiving and giving paths as well as differences between in-game and offline experiences. The approach taken in the current research is more consistent with the theoretical understanding of the complex and interdependent nature of social support indicators (Cobb 1976), little explored in an online game context (Trepte et al. 2012; O'Connor et al. 2015).

With an exploratory analytic position, our study examined the interplay of a constellation of social support indicators, namely, emotional and informational social support perceived in-game and offline by *WoW* players. Network analysis with centrality measures was used as this statistic is suitable to address our research question as shown in recent psychological studies (Costantini and Perugini 2016; Thompson et al. 2018). As guild membership has been found as a predictor for higher levels of social support (Longman et al. 2009), we also examined and illustrated the social support network for guild and non-guild members separately.

METHOD

Procedure

Participants were recruited through text based online announcements on websites catering to players of *WoW* (e.g. Rock Paper Shotgun) after permission was granted by website operators. Participants provide informed consent by being taken to an electronic informed consent form after clicking the link on the advertisement and indicating their consent by ticking a box and proceeding with the survey. No incentives were offered directly to participants; however, participants were informed that, for each participant who completes the online survey, AUD$1 would be donated to the charity Child's Play, http://www.childsplaycharity.org/, up to a pre-determined limit of AUD$300.

Participants

Participants were 181 (128 males, 53 females) *WoW* players. The average age was 25.07 years (SD=7.62; range 18–64 years). Participants mostly (77.9%) resided in Australia, followed by the USA (8.8%) and Canada (2.8%).

Measures

Two-way social support

Based on the two-way social support scale (Shakespeare-Finch and Obst 2011), in-game social support was assessed in terms of emotional and instrumental aspects (instrumental social support includes advice and help) using a 6-point Likert scale ([1] *not at all* to [6] *always*). Similarly, offline emotional social support was measured using twelve items. All subscales showed excellent internal consistency (Cronbach's α indices range from .85 to .97). Specific items and scale properties are shown in Appendix 1.

Guild membership

Participants reported whether they were guild members in *WoW* with a yes/no answer.

Data analytic plan

Bivariate correlations were first used among social support constructs in the study. To address our research questions, network analysis was used.

All analyses were performed using JASP (JASP Team 2020), an open-source statistical package. The least absolute shrinkage and selection operator (LASSO) was adopted. The nonparametric bootstrap method with 1000 replicates was applied given the small sample size (Epskamp et al. 2018). Although both parametric and nonparametric bootstrap methods can be applied for network analysis (Bollen and Stine 1992), we chose the nonparametric because the research variables are not multivariate normal based on Mardia's (1970) tests: multivariate skewness (Mardia's = 15.01, $\chi^2 = 462.11$, $p < 0.001$) and multivariate kurtosis (Mardia's = 106.50, $\chi^2 = 198.59$, $p < 0.001$).

Two main outcomes from network analysis were examined. First, a well-visualized network demonstrates the partial correlational relationships among variables. Each variable is represented as a node, while the links between nodes reflect the relationship. Darker blue indicates a strong positive association, whereas deep red shows a strong negative association. Strength of associations also can be referred from the thickness of the links. As a whole map, the network also demonstrates the group positions and proximity among all indicators. It is also important to note that these partial correlational relationships obtained from network analysis have already adjusted for the effects of other variables in the map (Hevey 2018). Second, three centrality indices will be examined in tandem with the network: betweenness shows the importance of a node for other nodes to affect each other, closeness means a node's relation with other nodes in terms of the indirect links, and strength reflects how strongly a node directly relates to other nodes (Freeman 1978). When network analysis is performed separately for guild and non-guild members, the visual differences in overall topology as well as centrality indices will be compared.

RESULTS

Bivariate correlation outcomes

Correlation analyses (Table 1) showed that all online social support constructs were significantly associated with each other, whereas offline constructs had weaker correlations. Emotional social support received offline was only associated with advice received from *WoW*, although emotional social support given offline correlated with most of the other variables.

Network among all participants

In the network structure among all participants, three groups are visually discerned (Figure 1). The offline social support group is distant from those in-game variables. A clear separation between emotional and informational social support is seen. Interestingly, the edges among online informational indicators are strong between in-game received advice and help as well as given advice and help. In terms of position, in-game advice giving bridges emotional variables and offline social support variables, although the links are weak.

Examining the centrality metrics (Table 2), in-game received advice and offline emotion given have the largest number of connections with other variables (i.e. betweenness), although the closeness and strength both indicate that help received from *WoW* is the most influential variable as it can quickly influence other indicators and has the strongest connections to other variables.

Table 1: Descriptive statistics and correlations among social support constructs.

Variable (abbr.)	*M*	SD	Skewness	Kurtosis	1	2	3	4	5	6	7	8
1. Emotional social support received (RES)	3.52	1.65	–0.22	–1.31	–							
2. Emotional social support given (GES)	3.51	1.47	–0.16	–1.00	.87***	–						
3. Informational social support (advice) received (RIS-A)	4.62	1.33	–0.96	0.25	.48***	.52***	–					
4. Informational social support (advice) given (GIS-A)	4.40	1.33	–0.73	–0.30	.51***	.56***	.67***	–				
5. Informational social support (help) received (RIS-H)	4.29	1.25	–0.83	0.32	.55***	.54***	.83***	.68***	–			
6. Informational social support (help) given (GIS-H))	4.34	1.15	–0.80	0.21	.37***	.46***	.72***	.74***	.75***	–		
7. Emotional social support received offline (RESo)	5.00	1.29	–1.47	1.42	.04	.10	.20**	.09	.12	.14	–	
8. Emotional social support given offline (GESo)	4.95	1.10	–1.19	1.12	.08	.20**	.27***	.15*	.22**	.24**	.76***	–

Note:
*$p < 0.05$,
**$p < 0.01$ and
***$p < 0.001$.

Table 2: Summary of centrality statistics for network models.

Variable (abbr.)	Model 1: All participants			Model 2: Guild members			Model 3: Non-guild members		
	Betweenness	**Closeness**	**Strength**	**Betweenness**	**Closeness**	**Strength**	**Betweenness**	**Closeness**	**Strength**
Emotional social support received (RES)	–0.54	0.14	0.4	–0.90	–0.79	0.17	–0.86	–0.26	–0.91
Emotional social support given (GES)	0.32	0.32	1.04	0.21	–0.59	**1.30**	–0.48	–0.22	0.04
Informational social support (advice) received (RIS-A)	**1.19**	0.85	0.36	**1.59**	**1.07**	0.65	–0.48	0.45	1.48
Informational social support (advice) given (GIS-A)	–0.54	0.27	–1.04	1.04	0.98	–0.85	–0.10	0.78	–0.59
Informational social support (help) received (RIS-H)	0.76	**1.15**	**1.13**	–0.35	0.95	1.02	0.29	0.97	–0.35
Informational social support (help) given (GIS-H)	–0.97	0.31	–0.03	–0.90	0.65	–0.35	**2.21**	**1.09**	**1.63**
Emotional social support received offline (RESo)	–1.4	–1.64	–1.81	–1.18	–1.27	–1.71	–0.86	–1.46	–0.60
Emotional social support given offline (GESo)	**1.19**	–1.41	–0.06	0.48	–1.00	–0.23	0.29	–1.35	–0.70

Note. The largest statistics in a column are in bold type. The centrality statistics are standardized and, therefore, are comparable to indices in the column.

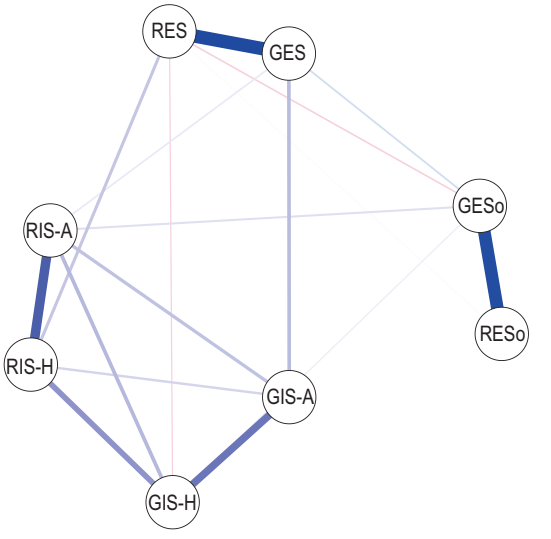

Figure 1: Estimated network structures for social support among WoW *players. Note: Each variable is represented as a node, while the links between nodes reflect the relationship. Darker blue indicates a strong positive association, whereas deep red shows a strong negative association. Strength of associations also can be referred from the thickness of the links. No negative inter-variable connections identified. RES = emotional social support received from* WoW. *GES = emotional social support given to* WoW. *RIS-A = informational social support (advice) received from* WoW. *GIS-A = informational social support (advice) given to* WoW. *RIS-H = informational social support (help) received from* WoW. *GIS-H = Informational social support (help) given to* WoW. *RESo = emotional social support received offline. GESo = emotional social support given offline.*

Guild members vs. non-guild members

When network analysis was performed separately for guild and non-guild members, three clear groups remained (Figure 2). However, the topology and centrality statistics showed differences.

For the guild members (Figure 2), informational variables are closely connected, especially between received help and advice in *WoW*. Advice received in game also had the most connections and shortest distance with other variables. Interestingly, the largest value of strength was for in-game emotion giving, indicating emotion giving in *WoW* had an influential impact on other model variables (Table 2).

For the non-guild members (Figure 2), inter-variable links among informational indicators are sparse. In contrast, in-game informational and emotional variables showed several links. Examining the centrality metrics, in-game help giving played a dominant role in the model (Table 2).

DISCUSSION

Using a network perspective, our study has extended the bivariate correlations to a system-level intercorrelation of social support perceived by *WoW* players. As hypothesized, in-game and offline social support components in all network models are clearly separate and centrality metrics suggest the key

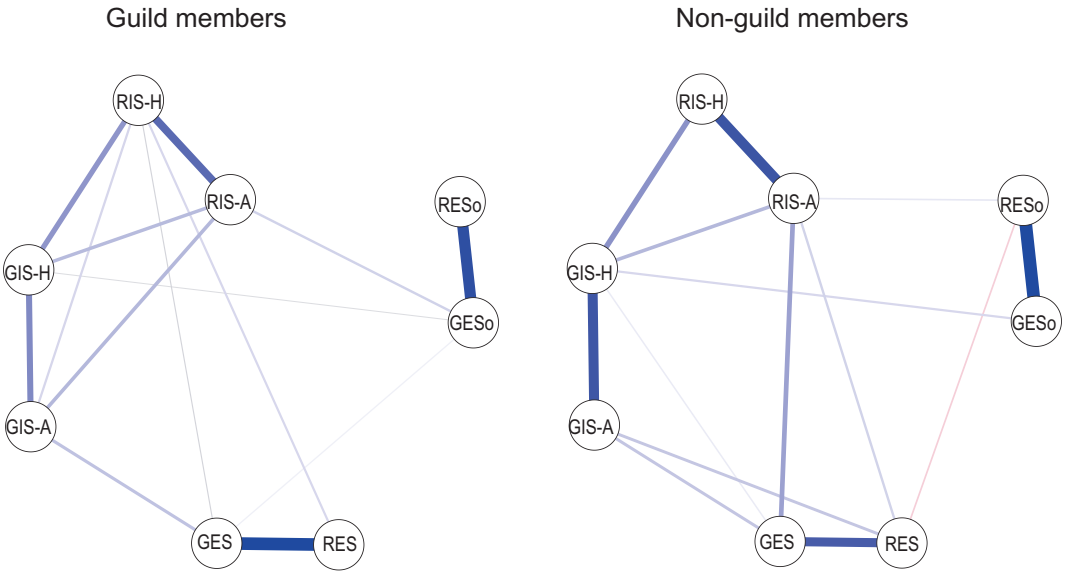

Figure 2: Estimated network structures for social support among WoW *players (guild and non-guild members' comparison).*
Note: Each variable is represented as a node, while the links between nodes reflect the relationship. Darker blue indicates a strong positive association, whereas deep red shows a strong negative association. Strength of associations also can be referred from the thickness of the links. No negative inter-variable connections identified. RES = emotional social support received from WoW. *GES = emotional social support given to* WoW. *RIS-A = informational social support (advice) received from* WoW. *GIS-A = informational social support (advice) given to* WoW. *RIS-H = informational social support (help) received from* WoW. *GIS-H = Informational social support (help) given to* WoW. *RESo = emotional social support received offline. GESo = emotional social support given offline.*

role of informational indicators in the network. With a novel analytic vehicle, our findings show that network analysis is a promising statistic in this context as it captures the influences of all related variables simultaneously. Consistent with previous findings that suggest the unidimensionality of online social support (e.g. Domahidi et al. 2018), statistics of the social support scale used in our study also suggest high internal consistency of overall items or subscales. However, network analysis further extends this scope of consistency, revealing the subtle dynamics among different types of social support. Our findings highlight the complex inter-item relationships which may have been overlooked in previous studies.

The salient role of informational social support is consistent with previous research. Game mechanics shape the patterns of socializations in *WoW* where teaming up for a game task is more promoted than emotional communication (Williams et al. 2006; Duchenaut et al. 2006). The social interactions in digital games do not reduce players' concentration on playing (Cairns et al. 2013). However, when guild membership is taken into account, some nuances are detected. For guild members, although the advice received in game had the greatest betweenness (the importance of a construct in influencing

other constructs) and closeness (how effectively a construct influences other constructs in the network), emotional support given in game had the largest strength (the strength of a construct's connection to other constructs in the network), suggesting guild members may receive more emotional and informational support if they increase the amount of emotional support given in *WoW*. By contrast, for non-guild members, no dominant emotional indicator was found in the network. The difference between guild/non-guild players' networks may reflect the morale or organization in these online teamwork groups (Williams et al. 2006). Moreover, although previous research notes that social networks do not naturally generate social support, higher social integration could promote the provision of social support (Nurullah 2012). Guilds in *WoW*, as online social organizations, may tie players in a socially integrated manner. However, these subtle social dynamics in online gaming environment require further investigation especially by incorporating more players' in-game characters (Kolo and Lüst 2019).

The bidirectional connections on informational support between guild and non-guild members also warrant further research to fully understand this reciprocal process. While the receiving direction is influential for guild members, the giving direction is important for non-guild members. This comparison may indicate that in-game guilds are well organized and provide advice and help for their members; this information source does not seem to be as strong for non-guild members. These differences in online informational support may also link to the pattern of their emotional-informational support relationships. Non-guild members showed relatively more links between their in-game informational and emotional support. This discrepancy, again, indicates that guilds in *WoW* have a heavy focus on game-specific teamwork, whereas non-guild members may not have a strong achievement-oriented focus on levelling up. Further studies could extend these findings to explore the differences in social support between people who belong to other types of gaming organizations. Given the potential associations between mental health and online game playing (Longman et al. 2009; Costa et al. 2018), social support network analysis could also incorporate health-related variables in order to examine their interrelationships.

The utilization of network analysis in our study is limited to self-reported measures. However, it is promising to include other in-game performance variables in the analyses. For example, activities in game (e.g. intra-guild interactions such as chatting hours, ganking [i.e. to defeat opponents in game] hours) can be characterized, as applied in physical sports studies (Gama et al. 2014); such metrics can be used in network analysis to explore how players' in-game activities relate to their online and offline social support. Moreover, players' actual social connections (e.g. their offline friendship groups and numbers) may also be taken into the network analysis (Dengah et al. 2018). Previous research has also identified the associations between guild identity (i.e. how a player sees themselves as a guild member) and motivations for socialization (Obst et al. 2018). Thus, social support networks between highly and poorly motivated players may also be discrepant.

Limitations

There are several limitations of this study. The study did not assess offline informational social support, potentially precluding links between online and offline indicators. With the focus on the functional perspective

(i.e. informational and emotional support), the structural aspects of social support (e.g. social ties and social capital) may have been overlooked. Our conceptualization of social support centres on one's perceived and received support rather than social networks between players. Using network analysis, further studies could also investigate the existence and structure of players' social network. Moreover, future studies with larger sample sizes (especially targeting populations beyond Australian predominantly male samples) and among other MMOGs players (especially more recent games) should further examine these connections. It is important to note that network analysis can be sensitive to idiosyncrasies in a sample, although a resampling technique (i.e. bootstrapping) was utilized. Replication with different samples is needed to build our understanding of social networks in the online gaming environment given online game playing may differ across countries.

APPENDIX 1. SOCIAL SUPPORT ITEMS USED AMONG *WORLD OF WARCRAFT* PLAYERS

In-game items		α
Emotional social support received	There is someone I know through *World of Warcraft* that makes me feel worthwhile.	.97
	There is at least one person I know through *World of Warcraft* that I can share most things with.	
	When I am feeling down there is someone I know through *World of Warcraft* I can lean on.	
	There is at least one person I know through *World of Warcraft* that I feel I can trust.	
	There is someone I know through *World of Warcraft* I can talk to about the pressures in my life.	
	I feel that I have a circle of people I know through *World of Warcraft* who value me.	
	There is someone I know through *World of Warcraft* I can get emotional support from.	
Emotional social support given	I am there to listen to other *World of Warcraft* players' problems.	.94
	I look for ways to cheer other *World of Warcraft* players up when they are feeling down.	
	Other *World of Warcraft* players who are close to me tell me their fears and worries.	
	I give other *World of Warcraft* players a sense of comfort in times of need.	
	Other *World of Warcraft* players confide in me when they have problems.	
Informational social support (advice) received	If I am having trouble finding a location in *World of Warcraft*, there is someone I can ask for help.	.89
	There is someone I can go to for advice on character builds.	
	If I cannot figure out how to defeat a boss or finish a raid, there is someone who can give me advice.	
Informational social support (advice) given	If someone is having trouble finding a location in *World of Warcraft*, they can come to me for help.	.85
	People can come to me for advice on character builds.	
	If someone cannot figure out how to defeat a boss or finish a raid, I will give them some advice.	
Informational social support (help) received	If I need some crafting materials or gold, I know someone who will give them to me.	.89
	If I am being ganked, I know I can get some help.	
	I can get help to deal with a difficult monster.	
	I know some high-level players who will run me through a dungeon.	
	If a group I am in needs more players, I know some people I can ask to join.	
Informational social support (help) given	If someone needs some crafting materials or gold, I will give it to them.	.87
	If someone is being ganked, I will help them.	
	I will help others deal with a difficult monster.	
	I will run low level players through dungeons.	
	If a group needs more players, I will join them.	

(Continued)

APPENDIX 1. *(Continued)*

Offline items		
Emotional social support received offline	There is someone I can talk to about the pressures in my life.	.96
	There is at least one person that I can share most things with.	
	When I am feeling down there is someone I can lean on.	
	There is someone in my life I can get emotional support from.	
	There is at least one person that I feel I can trust.	
	There is someone in my life that makes me feel worthwhile.	
	I feel that I have a circle of people who value me.	
Emotional social support given offline	I am there to listen to others' problems.	.93
	I look for ways to cheer people up when they are feeling down.	
	People close to me tell me their fears and worries.	
	I give others a sense of comfort in times of need.	
	People confide in me when they have problems.	

Note. A 6-point Likert scale was used for all social support measures: 1 – *not at all* to 6 – *always*. α=Cronbach's α.

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