Parenting, Children's Behavioral Problems, and the Social Information Processing Among Children

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The aim of the present research was to investigate the relationship between parenting, children's social information processing, and their behavioral problems. Sample of the study consisted of 106 children ($n = 52$ boys; $n = 54$ girls), the age range of 8 to 11 years, their mothers, and their teachers. Parent Questionnaire (Doyle & McCarty, 2002), Home Interview with Child (Dodge, 1986), and Child Behavior Checklist (Achenbach & Rescorla, 2001) were used to assess parenting behaviors, children's social information processing, and their behavioral problems respectively. It was hypothesized that negative parenting will positively predict children's behavioral problems, positive parenting will negatively predict children's behavioral problems, and finally children's hostile social information processing will positively predict their behavioral problems over and above parenting. Hierarchical multiple regression analyses was used for hypotheses testing. The results of the study provided support for the hypotheses.

Keywords: social information processing, children's behavioral problems, parenting

Contemporary viewpoints on parenting differentiate between parenting styles and parenting practices (e.g., Darling & Steinberg, 1993; Mize & Pettit, 1997) and further between parenting dimensions and types (e.g., Barber, Stolz, & Olsen, 2005) as well. Parenting style is described as being reflected in the emotional tone of parent-child

relationships and in the behaviors which display a general orientation of parents towards the child (e.g., acceptance vs. rejection). Parenting practices are behaviors which are primarily goal-oriented parenting behaviors i.e., they are supposed to have an effect for example, parent helping a child with homework or helping him/her resolve a conflict with a sibling. Apart from this, parenting typologies are also used to categorize parents according to different combinations of parenting behaviors. The classic work of Baumrind (1967) is best known in this regard. However, over the years the typological approach had fallen out of favor because researchers started to "unfold" the typologies to understand in depth that which parenting dimension had the greatest amount of significance at different points in development (Barber et al., 2005).

These parenting dimensions can be negative or positive and researchers have considered a number of indicators of negative parenting dimension for example, parental rejection (Rohner, 2004), intrusiveness (Barber et al., 2005), and harsh physical discipline (Gershoff, 2002). When it comes to parenting, harsh discipline used by parents has been researched the most and findings generally suggest that children who are exposed more to harsh discipline by their parents are at a greater risk of developing a number of externalizing (e.g., aggression) and internalizing (e.g., anxiety) behavior problems (Gershoff, 2002), suffer from a decline in their well-being (Amato & Fowler, 2002), and score lower on measures of social skillfulness rated by their teachers (Pettit, Bates, & Dodge, 1997). Among the most frequently researched negative outcome or behavioral problem occurring as a result of harsh discipline is child aggressive behavior.

Researchers have indicated that harsh parenting is a predictor of aggressive behavior in children (Deater-Deckard, Dodge, Bates, & Pettit, 1996; Pettit & Arsiwalla, 2008; Swinford, DeMaris, Cernkovich, & Giordano, 2000; Weiss, Dodge, Bates, & Pettit, 1992). Numerous styles of positive parenting have also been studied (e.g., warmth, involvement, teaching) and researchers have suggested that when positive parenting is used more it results in less behavioral problems and more good adjustment of the child. Positive parenting results in lessened externalizing problems (Eisenberg et al., 2005) and also in lower levels of noncompliance and negative affect, and higher levels of positive affect (Webster-Stratton, 1998). Hill et al. (2004) suggested that parent's academic involvement in grade 7 was negatively related to grade 8 behavioral problems and positively related to grade 11 aspirations. Research has also shown that family coercion experienced at a young age predicted behavior problems but

the association between behavior problems and lack of parent-child positive interactions was found to be stronger (Pettit & Bates, 1989). Therefore it can be said that both positive and negative parenting are essential to the understanding of the phenomenon of parenting and research on the association between parenting and child behavior can gain if researchers simultaneously measure both positive and negative dimensions of parenting.

Further the social information processing (SIP) model tells us how a child selectively stores social cues, how he interprets it, selects a response, and acts upon it. The basic principle of the model is that a child responds to a challenging social situation for example, he/she responds to a provocation by a peer or handles a snub by a peer in group entry context, according to the working of 4 social cognitive steps. This theory emphasizes that people come to social situations with a set of predetermined biological capabilities and schemas stored in their memory that are built on past experiences with others; these in turn determine whether a child will react in a negative (e.g., aggressive) or a positive (e.g., pro-social) manner (Crick & Dodge, 1994).

The first step of the SIP model i.e., encoding describes how a child attends to relevant social cues in an unbiased and accurate manner (Dodge, 1993). Researchers have indicated that children with a high level of aggression were more prone to make mistakes in encoding relevant social cues because they mostly paid selective attention and stored only those cues which were indicative of threat or hostility (Mize & Pettit, 2008). To be more specific, children with a higher level of aggression are more susceptible to pay their attention on less relevant interpersonal cues (Dodge & Newman, 1981) and to use fewer social situation cues with which they are presented.

The second step in the SIP model i.e., interpretation describes the cause behind an event as understood by the child (Crick & Dodge, 1994; Mize & Pettit, 2008). A large number of researches have examined the relationship between aggressive behavior and hostile attribution bias (the term hostile attribution bias refers to a tendency to perceive hostile intentions in the behavior of others in ambiguous situations; Dodge, 2006), and two meta-analyses reported robust to modest effect sizes (Orobio de Castro, Veerman, Koops, Bosch & Monshouwer, 2002; Yoon, Hughes & Gaur, 1999). Research done on the SIP model states that children with a high level of aggression are more prone towards attributing hostile intentions to the ambiguous actions of their peers. When they are presented with vignettes showing accidental peer provocation they tend to think that their peer acted

with a malicious intent (Crick & Dodge, 1996; Dodge, 1980; Peets, Hodges, Kikas, & Salmivalli, 2007; Weiss et al., 1992).

The third step of the SIP model i.e., response generation describes how a child generates one or more possible behavioral responses to a given situation. The SIP model states that children with a high level of aggression generate more aggressive responses (Dodge et al., 2003; Mize & Ladd, 1988; Slaby & Guerra, 1988; Waas, 1988; Waldman, 1996). They are also more prone to generate responses which incline towards manipulation and coercion (Rubin, Moller, & Emptage, 1987) and responses which are more individualistic or vague (Pettit, Dodge, & Brown, 1988). Aggressive children also tend to generate responses which are more inappropriate (Asher & Renshaw, 1981), unassertive (Asanrow & Callan, 1985), and less prosocial (Asher & Renshaw, 1981; Pettit et al., 1988).

The fourth step in the SIP model i.e., response evaluation and decision describes how a child evaluates the potential behavioral responses in terms of the possibility that it will result in desired outcomes and also in terms of their self efficacy i.e., whether he/she will be able to enact that particular response or not. Researchers suggest that children with a high level of aggression tend to positively evaluate aggressive responses (Crick & Dodge, 1996; Crick & Ladd, 1991; Dodge, Pettit, Bates, & Valente, 1995; Dodge et al., 2003; Lansford et al., 2006; Quiggle, Garber, Panak, & Dodge, 1992; Trachtenberg & Viken, 1994; Weiss et al., 1992) and expect that these responses will result in positive and useful outcomes (Hart, Ladd, & Burleson, 1990). They use their aggression to achieve the desired outcomes (Lochman & Dodge, 1994) and to have less negative outcomes in their social interactions (Quiggle et al., 1992). It is also suggested that children who can be said to have disruptive behavior have a lot of confidence in their ability to act aggressively (Erdley & Asher, 1996; Quiggle et al., 1992).

On the whole it has been observed that parenting is linked to children's behavioral problems and SIP is linked to negative child behaviors (e.g., aggression, delinquency, and violence). But these references shed light on the trends of SIP research done in the west. As far as Pakistan is concerned only one research has been done in this area and that research was primarily a comparative study of the social information processing styles of aggressive and non aggressive children (Mushtaq, 2007). Virtually, no research has been done in Pakistan which relates parenting and children's social information processing to their behavioral problems. The aim of this study is to extend the research on Dodge's social information processing model in Pakistan and this research study will focus on the second

(interpretation) and third (response generation) steps of the SIP model. There are two main objectives of the study: first, to understand the association between parenting (positive and negative both) and children's behavioral problems and second, to understand the association between social information processing and children's behavioral problems.

It was hypothesized that positive parenting (i.e., warmth /involvement and appropriate consistent discipline) would negatively predict behavioral problems (externalizing problems) and negative parenting (i.e., harsh physical discipline) would positively predict behavioral problems (externalizing problems) among children. Also children's social information processing (i.e., hostile attribution and aggressive responses) would positively predict behavioral problems (externalizing problems) among children over and above parenting.

Method

Participants

The sample consisted of 106 children (boys = 52; girls = 54), their mothers, and their teachers. Children's age ranged between 8 to 11 years ($M = 9.65$, $SD = .98$) and they were recruited from private and public sector schools of Lahore. Children were selected according to the inclusion criteria i.e., only those children were selected who belonged to intact families (i.e., no case of separation or divorce and both parents being alive). Their mothers were also contacted: their age range was 21 to 54 years ($M = 36. 7$, $SD = 5.42$), they had at least 8 years of education, 37 were employed, 69 were housewives, 64 belonged to nuclear families, 42 belonged to joint families, and their number of children ranged from 1 to 8. The class teachers of the children who had taught them for at least one year were also contacted to fill the teacher rating forms ($n = 106$).

Measures

The Parent Questionnaire (Doyle & McCarty, 2002). Parenting dimensions (both positive and negative) were measured through the Parent Questionnaire (Doyle & McCarty, 2002). The Parent Questionnaire (PQ) is a self report measure through which parent's report about three different dimensions of parenting. It contains 22 items with responses given on a 5-point Likert scale i.e., *never* (1), *rarely* (2), *often* (3), *very often* (4), and *always* (5). The parenting dimensions measured by PQ are appropriate consistent

discipline (7 items), warmth/involvement (9 items) and harsh physical discipline (4 items) and two items are used for measuring inter-parental consistency. A total parenting score gives an estimate of the favorability of that parenting style. The PQ had satisfactory psychometric properties with a Cronbach's alpha coefficient of .78 and a test-retest reliability of .79 after 6 months (Doyle & McCarty, 2002). For this research the Urdu version was used (Anjum & Malik, 2010). The item to item correlation between the English and Urdu version was reported to be .80 to .91 ($p < .0001$) showing a highly significant correlation between Urdu and English version items and Cronbach's alpha coefficient was reported to be .73. For analysis the total raw score of each subscale (obtained by adding the score of each subscale item) was used and the raw score for inter-parental consistency was not used since it was not required keeping in view the objectives of the study; all this was done keeping in view a previous research (Anjum & Malik, 2010) where higher scores on any subscale indicated the dominancy of that parenting dimension. Cronbach's alpha for the current sample was found to be .88.

Home Interview with Child (Dodge, 1986). Children's social information processing was measured through the social information processing task which is called the Home Interview with Child (HIWC; Dodge, 1986). This measure is used for measuring attributions of intent and response generation steps of the SIP model. The age range for this measure is 5 to 12 years. This measure comprised of eight stories in written and in picture form. Four stories depicted ambiguous peer provocation (e.g., being bumped from behind) and the rest of the four stories depicted peer group entry dilemmas (e.g., not being allowed to sit with a group of kids at lunch time). Each story is followed by two questions measuring the attribution of intent (8 items/questions) and response generation (8 items/questions).

This measure is administered in a way that children are asked to look at the pictures of the stories and the stories are orally narrated to each child and after the oral narration of each story two questions are asked. The first question is about the intent of the peer (attribution of intent) and the second question is about the response of the child (response generation). All the responses are immediately coded. With regard to "attribution of intent" responses are coded as either *non hostile* or hostile. Non hostile responses indicate that whatever had happened in the story it was accidentally done by the peer whereas hostile responses indicate that whatever had happened in the story was intentionally done by the peer. With regard to "response generation" the participants' responses are coded as non aggressive responses and

aggressive responses. Non aggressive responses included the responses where the child suggests making a comment or asking a question to the other child, responses where the child would not do anything to the provocateur, and responses where the child says I don't know, or any response which do not fit in any of the other scoring categories. Whereas aggressive responses included the responses where a child stated that he or she would directly retaliate aggressively i.e., physically or verbally aggressive responses, ask an adult to punish the peer i.e., responses including threats or responses where the child suggests seeking out an adult who would punish the provocateur, and responses where the child would command the peer i.e., where the child requests or demands that the other child do something specific.

This coding is done keeping in view previous researches e.g., Conduct Problems Prevention Research Group US (1999). In the analysis the "hostile attribution" score reflects the number of stories in which the child's response was coded as hostile and "aggressive responses" score reflects the number of stories in which the child's response was coded as aggressive responses; this was also done keeping in view a previous research (Schultz & Shaw, 2003). All these stories were originally in English language and were worded in a way, using gender-neutral names for all the characters, to keep the gender of the characters ambiguous ($\alpha = .91$; Dodge et al., 1995). But all these stories were translated and adapted according to the Pakistani culture and in this process all eight stories were given two versions, one for boys and the other for girls.

The stories were already adapted for boys (Mushtaq, 2007) and the inter-rater reliability was found to be .81. But these stories were adapted for girls as a part of this research. The pictures depicting the stories were changed i.e. boys were replaced by girls and in one of the stories cricket was replaced by ice water (*burf pani*). This was done after asking 100 girls to name 3 most commonly played games by Pakistani girls when 59% girls stated it to be ice water (*burf pani*); cricket was replaced by ice water, rest of the situations were retained as it is. The written stories were also adapted to represent girls instead of boys. Home Interview with Child was found to be a highly reliable measure for the current sample, both girls and boys.

On Home Interview with Child (for boys) the alpha values for questions dealing with hostile attribution (8 items) was $\alpha = .94$ and for questions dealing with response generation (8 items) was $\alpha = .95$, and on Home Interview with Child (for girls) the Cronbach's alpha for questions dealing with hostile attribution (8 items) was $\alpha = .93$ and for questions dealing with response generation (8 items) was $\alpha = .91$.

Child Behavior Checklist (Achenbach & Rescorla, 2001). Child behavioral problems were measured through the Urdu version of the Teacher Report Form (TRF) of the Child Behavior Checklist (Achenbach & Rescorla, 2001). This measure is used for girls and boys in the age range of 6 to 18 years. It has 113 items which are rated on a 3-point Likert scale. It is used to assess the behavioral problems and social competencies of children. For each of 113 behavior items, the teachers of the participants are asked to check 0 if the statement is "*not true*" for the child, 1 if it is "*somewhat true*", and 2 if it is "*very true*" or "*often true*".

For analysis the total (raw) score for "externalizing problems" which is obtained by combining the raw scores of the behavioral domains of rule-breaking behavior (12 items) and aggressive behavior (20 items) was used. The psychometric properties of CBCL are satisfactory. Test-retest reliability is reported to range from .95 to 1.00, inter-rater reliability ranged from .93 to .96, internal consistency ranged from .78 to .97, and criterion validity was also acceptable (Achenbach & Rescorla, 2001). In this research Cronbach's alpha was found to be .92.

Procedure

First of all, school authorities were contacted and permission was sought to conduct the study. Then as a first step of data collection, consent forms and a demographic profile form were distributed among the students of grade 4 and 5. Students were instructed to get the forms filled from their parents only. Out of the students who brought their consent forms and demographic profiles back only those were selected whose profiles were according to the inclusion criteria. Further Home Interview with Child was individually administered on each student.

Next, their mothers were personally contacted at their homes to get the Parent Questionnaire filled. After this child's teachers were contacted and were told about the child for whom they were going to fill the CBCL and TRF forms. The response rate for the current research was 38.81%. Over all 590 consent forms and demographic profiles were distributed out of these 229 returned, and 106 which met the inclusion criteria, and did not have any missing information ended up being in the final sample. So after getting the final data it was entered in SPSS version 16.0 and analyzed using both descriptive and inferential statistics.

Results

The study aimed to examine the effect of parenting and social information processing on children's behavioral problems. As a first step of analysis, mean and standard deviation of all the measures and correlation amongst all the study variables was computed (see Table 1). Then further hierarchical multiple regression analyses was used for hypotheses testing. Since the predictors i.e., parenting and SIP were selected based on past work that is why hierarchical multiple regression analyses was used. The contribution of parenting and the unique variance of SIP variables to children's externalizing problems was examined by computing three separate hierarchical multiple regressions with each parenting style entered on the first step and hostile attribution and aggressive responses entered on the second and third steps respectively; with externalizing problems as dependent variables in all the three equations (see Table 2).

Table 1

Means, Standard Deviation, and Correlations among the Study Variables

Variables	1	2	3	4	5	6
1. HA	-	.40***	.65***	-.19*	-.22*	.26**
2. AR		-	.52***	-.40***	-.36***	.25**
3. EP			-	-.47***	-.42***	.23*
4. W/I				-	.48***	-.46***
5. A/CD					-	-.43***
6. H/PD						-
M	3.84	3.14	12.78	30.10	21.23	9.73
SD	3.13	3.23	18.31	12.5	9.69	6.18

Note. HA = Hostile Attribution; AR = Aggressive Responses; EP = Externalizing Problems; W/I = Warmth/Involvement; A/CD = Appropriate/Consistent Discipline; H/PD = Harsh/Physical Discipline.
*$p < .05$. **$p < .01$. ***$p < .001$.

As shown in Table 1, correlations amongst all the study variables ranged from .19 to .65 and all are significant supporting the assumed directions of relationships: positive between SIP and externalizing problems, positive between negative parenting and externalizing problems, and negative between positive parenting and externalizing problems. The mean score of the sample is higher on hostile attribution in comparison to aggressive responses.

Table 2

Hierarchical Multiple Regression Analyses Predicting Children's Externalizing Problems from Their Parenting and Social Information Processing

Variables	Externalizing Problems			
	R^2	ΔR^2	β	Δt
Block 1	.22	.22		
Warmth/involvement			-.47***	-5.49***
Block 2	.55	.33		
Hostile attribution			.58***	8.78***
Block 3	.58	.02		
Aggressive responses			.18*	2.52*
Block 1	.18	.18		
Appropriate consistent discipline			-.42***	-4.82***
Block 2	.51	.33		
Hostile attribution			.59***	8.40***
Block 3	.55	.04		
Aggressive responses			.23**	3.03**
Block 1	.05	.05		
Harsh physical discipline			.23*	2.43*
Block 2	.43	.38		
Hostile attribution			.64***	8.32***
Block 3	.50	.07		
Aggression responses			.30***	3.94***

*$p< .05$. **$p< .01$. ***$p< .001$.

As shown in Table 2, the results indicated hostile attribution and aggressive responses as significant positive predictors of externalizing problems in all three regression equations. With warmth/involvement, children's hostile attribution and aggressive responses explained 55% and 58% of the variance $\Delta R^2 = .33$, $F(2, 105) = 64.69$, $p < .000$; $\Delta R^2 = .02$, $F(3, 105) = 47.49$, $p < .000$ respectively. With appropriate consistent discipline, hostile attribution and aggressive responses explained 51% and 55% of the variance $\Delta R^2 = .33$, $F(2, 105) = 54.68$, $p < .000$; $\Delta R^2 = .04$, $F(3, 105) = 42.44$, $p < .000$ respectively and with harsh physical discipline, hostile attribution and aggressive responses explained 43% and 50% of the variance $\Delta R^2 = .38$, $F(2, 105) = 39.54$, $p < .000$; $\Delta R^2 = .07$, $F(3, 105) = 35.26$, $p < .000$ respectively. Among the three models, the third model has caused the maximum variance with hostile attribution and aggressive responses standing out as the

strongest significant positive predictors of externalizing problems in this model and causing $\beta = .64$ and $\beta = .30$ change to the prediction respectively.

Discussion

In this research three hypotheses, which revolved around the role of parenting and social information processing in predicting externalizing problems in 8 to 11 years old children, were tested. The results of the study provided support for the hypotheses of the study. Parenting styles were found to be significant predictors of children's externalizing problems. Positive parenting (warmth/involvement and appropriate consistent discipline) was found as having negative relationship with children's externalizing problems where as negative parenting (harsh physical discipline) was found to be having a positive relationship with children's externalizing problems. Results also supported the last hypothesis and indicated children's social information processing (hostile attribution and aggressive responses) as a unique and positive predictor of children's externalizing problems.

In Pakistan little work has been done to explore the role of parenting and aggressive behavior of children (Akhter, Hanif, Tariq, & Atta, 2011; Sattar, 2009; Yousaf, 2008). We found positive parenting as significant negative predictor and negative parenting as significant positive predictor of externalizing problems in our sample. These findings are in line with studies done in Pakistan and with western literature as well, where it has been suggested that positive parenting leads to lower levels of behavioral problems e.g., lower levels of externalizing problems (Eisenberg et al., 2005) and conduct problems (Webster-Stratton, 1998) and harsh physical discipline leads to aggression and anxiety among children (Deater-Deckard et al., 1996; Gershoff, 2002; Pettit & Arsiwalla, 2008; Swinford et al., 2000; Weiss et al., 1992). Among the possible explanations for this relationship that are most often discussed state that indicators of positive parenting e.g., protective care giving, empathy, trust; facilitate children's ability to self regulate their negative emotions and cope with their environment in an adaptive and flexible manner (Cassidy, 1995). Parents' sensitive and empathetic responding to their child's problem facilitates the child's empathetic capability (e.g., Davidov & Grusec, 2006; Eisenberg & Fabes et al., 1998). In terms of the indicators of negative parenting e.g., parental control researches show that when it takes the form of punishment and power assertion in a harsh and rejecting manner, to the needs of the child, it leads to

negative outcomes (Rothbaum & Weisz, 1994) because these power-assertive interventions threatens the autonomy of a child and for healthy development children need to feel that their behavior is self-generated and not driven by external forces (Grusec & Davidov, 2007).

However, we found no literature exploring the role of social information processing over and above the effect of parenting on children's adjustment and behavioral problems in Pakistan. The present study was conducted to explore the effect of SIP after controlling for parenting styles. The findings of the present research indicated the unique and significant contribution of children's SIP after controlling parenting styles supporting the previous researches (Crick & Dodge, 1996; Dodge, 1980; Peets et al., 2007). It shows that though parenting is an important factor which may lead to adjustment problems among children (Deater-Deckard et al., 1996; Eisenberg et al., 2005) social information processing may also contribute to elevate the levels of children's externalizing problems (Orobio de Castro et al., 2002; Weiss et al., 1992; Yoon et al., 1999). The possible explanation for these results comes from research where SIP styles have been said to reflect dispositions to process information i.e., SIP styles resemble personality patterns (Crick & Dodge, 1994) and also from the differential susceptibility hypothesis (Belsky, 1997) which states that a person's susceptibility to the environmental influences vary as a function of his or her individual traits.

The SIP model has explained 4 steps of children's processing of their environment i.e., encoding, interpretation, response generation, and response evaluation and decision. In the absence of indigenous research on the SIP model we studied the 2nd (hostile attribution) and 3rd (aggressive responses) steps of the SIP model as in the west a lot of research has been done on these two steps. Our results support the previous researches explaining children's hostile attribution and aggressive responses as significant predictors of behavioral problems (Crick & Dodge, 1996; Dodge et al., 2003). These studies suggest that children having a tendency to attribute hostile intents to their peer's ambiguous actions are more likely to have externalizing problems (Crick & Dodge, 1996; Dodge, 1980; Peets et al., 2007; Weiss et al., 1992). Similarly children having a tendency to generate aggressive responses to their peer's ambiguous actions are also more likely to have externalizing problems (Dodge et al., 2003; Mize & Ladd, 1988; Slaby & Guerra, 1988; Waas, 1988; Waldman, 1996). Results show that children's hostile attribution and aggressive responses may elevate the levels of children's externalizing problems after controlling for positive and negative parenting. These findings may be

attributed to the fact that children's personal thinking styles, their ability of perceiving social cues and their behavioral tendencies are as important in their adjustment as parenting and may act independently in elevating their externalizing problems. These results also show the cultural similarity between west and Pakistan.

Limitations and Suggestions

A few limitations of this research can be taken care of in a future research. First of all only two indicators of social information processing were assessed i.e., hostile attribution of intent and response generation. In future researches, to get a holistic understanding of a child's social information processing and to test the model, all the four indicators of SIP can be assessed. Also the inter-rater reliability of SIP measures can be made a part of a future project as this was not done in this research. Secondly reporters for behavioral problems can be two to three as well e.g. in this research child behavioral problems were reported by teachers only, in future researches ratings can be taken from peers and mothers as well. Finally we can explore gender differences in terms of social information processing styles as present study do not address this.

Conclusion

The findings of the present study are in line with earlier researches supporting the links between parenting styles and children's adjustment and their behavioral problems. The important contribution of the current study is the unique role of children's SIP (hostile attribution and aggressive responses) in elevating their behavioral problems. However, the role of SIP (and its various steps) as mediator or moderator depending upon the specific cultural conditions may be the interesting query for future research.

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