

Child Caregiver Interaction Scale (CCIS) (Carl, 2010) Compared to Arnett CIS (Arnett, 1989): An Updated Measure to Assess Quality Child Caregiving

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Abstract

While multiple assessment measures of process indicators exist, the need for a valid, reliable, research and theoretically based global measure for assessing the quality of child caregiver interactions remains. One of the most widely used caregiver interaction measures, the Arnett Caregiver Interaction Scale (CIS) (1989), provides a basic measure of child caregiver interaction, yet also has serious limitations (i.e., lack of operational definitions, minimal attention to recent brain development research, weak reliability and validity, and extensive adaptations in the field). The Child Caregiver Interaction Scale (CCIS) (Carl, 2007, 2010), largely based upon the National Association for the Education of Young Children's (NAEYC) Developmentally Appropriate Practice (DAP) position statements (NAEYC, 2009; Bredekamp and Copple, 1997), is a valid and reliable measure for assessing the interactions of child caregivers and the children in their care. The CCIS measure demonstrates high internal consistency and strong utility across settings and child care giving age groups, including infant, toddler, preschool and home base child care.

Keywords: child care quality, Arnett Caregiver Interaction Scale, caregiver interaction, early care and education

1. Introduction

Research on early brain development and early childhood demonstrates that the experiences children have and the attachments children form early in life have a decisive, long-lasting impact on their later development and learning (Mortensen and Barnett, 2015; Iruka & Morgan, 2014). High-quality care beginning in early childhood improves children's school success (Isthimine, Taylor & Bennett, 2010; Karoly, et al, 1998). A large review of literature suggests the link between quality care and education and children's academic success (Auger, et al, 2014). Numerous studies indicate that children in high quality child care demonstrate greater mathematical ability, greater thinking and attention skills, and fewer behavioral problems than children in lower quality care (Wen, Bulotsky-Shearer, Hahs-Vaughn, and Korfmacher, 2012). These differences hold true for children from a range of family backgrounds, with particularly significant effects for children at risk (Hall, et al, 2013; Zigler, Finn-Stevenson, and Hall, 2002; Peisner-Feinberg, et al, 2001; Lamb 1998).

Research supports using a combination of classroom environment and caregiver interaction when defining the quality of childcare. While instruments exist that measure environmental quality, (Infant/Toddler Environmental Rating Scale, Revised Edition (ITERS 3) (Harms, T., Cryer, D., Clifford, R. M., & Yazejian, N. (2017) , Early Childhood Environmental Rating Scale, Revised Edition (ECERS 3) (Harms, T., Clifford, R. M., & Cryer, D. (2014), the School-Age Care Environment Rating Scale (SACERS) (Harms, Jacobs, and White, 1996), and the Family Day Care Rating Scale (FDCRS), (Harms, T., Clifford, R.M., and Cryer, D. (1998, 2003), a scientifically sound and research based instrument to assess the global quality of child care staff interactions is lacking.

The majority of caregiver interaction measures focus on a caregiver's interaction with an individual child (the targeted unit of analysis for any one particular study), rather than the caregiver's interaction with all children in care. Additionally, no one assessment device exists for measuring the interaction between a child care provider and children in multiple age groupings, ranging from infancy through school-age, in both center and family based care.

Most caregiver interaction scales remain limited to specific age groupings and therefore do not cover the age spectrum found in most child care facilities. Given the International, National and State level focus on child care quality improvement, a need exists for an instrument that can monitor, evaluate and assess the quality of child caregiver interactions at multiple ages in multiple settings.

2. The Arnett Caregiver Interaction Scale (CIS) (1989)

One of the most widely used measures of caregiver interaction is the Arnett Caregiver Interaction Scale (CIS) (Arnett, Ru1989). Because of its widespread use, this measure served as a starting point for developing the Child Caregiver Interaction Scale. The Arnett CIS (1989) is used frequently as a process indicator of childcare quality. A review of *Child Care and Early Education Research Connections*, an online repository of early care and education publications sponsored by the Office of Planning, Research, and Evaluation, Administration for Children and Families, United States Department of Health and Human Services, found 298 peer reviewed studies, between 1989 and 2017 that either utilized or referenced the Arnett CIS (<http://www.researchconnections.org>). These research studies encompassed family (Groeneveld, Vermeer, Ijzendoorn, and Linting, 2016; Hughes-Belding, Hegland, Stein, Sideris, and Bryant, 2012) and center (Lewsader and Elicker, 2013) based care of infants (Kim, 2016), toddlers (Sylva, Stein, Leach, Barnes, and Malmber, 2011; Rosenthal and Gatt, 2010) and preschool aged (Auger, Farkas; Bassok, Fitzpatrick, Greenberg, and Loeb, 2016; Upshur, Wenz-Gross, and Reed, 2013) children. Further, many studies occurred from outside of the United States, including those conducted in Australia, (Davis, E, et al, 2015), Greece (Rentzou, K. & Sakellariou, M., 2011); Germany (Eckhardt and Egert, 2017), Portugal (Barros, et al, 2016), the Netherlands (Fukkink, 2010, 2007), Sweden (Lundqvist, Westling, & Siljehag, 2016), and United Kingdom (Barnes, et al (2010); Mathers, et al, 2007).

The following presents the strengths and limitations of the Arnett Caregiver Interaction Scale (CIS). The Child Caregiver Interaction Scale (CCIS) is then highlighted in comparison.

2.1 Strengths of the CIS

The Arnett CIS is used extensively to assess the quality of caregiver interaction, both in research studies, and in state quality initiatives. The Arnett CIS has been used in many large scale research studies, with a variety of populations (Hindman, Pendergast, and Goore, 2016; Colwell, et al, 2013). Colorado, Kentucky, Maryland, Montana, North Carolina, Oklahoma, Pennsylvania, Tennessee and Vermont have used the Arnett CIS to assess child care quality (NAEYC, 2005).

Clearly there is a need for a relatively easy to use child caregiver interaction measure that can be utilized with various age groupings in different settings. There is wide name recognition in the field for this measure, which encouraged the need to revisit the measure, rather than to reject it and create something in isolation.

2.2 Limitations of the CIS

2.2.1 Recent research on Developmentally Appropriate Practice in early care and education. While the study of the effect of child care quality on children's behavior and psychological outcomes has long been a tradition in early childhood education (Lahti, Elicker, Zellman and Fiene, 2015; Burchinal, Vandergrift, Pianta, and Mashburn, 2010; NICHD Early Child Care Research Network (2002); McCain and Mustard, (1999), attempts to operationally define Developmentally Appropriate Practice (DAP) is a relatively new undertaking. The first definitive position on DAP was adapted by the National Association for the Education for Young Children (NAEYC) in 1986 (Gestwicki, 1999).

In 1997 and again in 2009, NAEYC further expanded their position on DAP. Several factors attributed to the need for this revision: The growing number of infants and toddlers in out of home settings; the changing demographics in the United States, which generates more culturally diverse children and families in care; research that indicates children with disabilities or developmental delays are best served when they are engaged in inclusive classrooms; the emphasis on school readiness for prekindergarten and kindergarten age children; the development of state early learning standards; the inclusion of prekindergarten programs in public school systems; and the demands of *No Child Left Behind* legislation (Gestwicki, 2013). Additionally, the demands of the Every Student Succeeds Law places further emphasis on early learning and student success.

The Arnett CIS is based upon child care studies and literature from 1976 through 1985. Because of the breadth of more recent research on the necessary components of early care and education, the CIS begs to be updated to current standards.

2.2.2 Lack of operational definitions in the CIS. The original Arnett CIS has very limited published or accessible materials relating to validity (Colwell, Gordon, Fujimoto, Kaestner, Koreman (2013). In fact, the definitions and explanations of the items are limited only to what is written in the scale. Through the course of using the measure, numerous researchers have added descriptors, which may or may not fit with the original intent of the measure and introduces discrepancies among results. This lack of standardization makes widespread use of the measure inconsistent and comparison to other studies suspect. Because of this lack of definition, interpretations of the measure can be wide and varied. More closely aligning the definitions and descriptors of this measure with DAP should assist in providing clarity to the instrument.

2.2.3 Adaptations of the CIS. A review of the CIS related literature indicates the measure gets routinely altered to meet specific researcher needs for particular studies. For example, Jaeger & Funk (2001) report the Arnett as a 26-item measure that assesses the quality and content of teacher's interactions with children, organized into four subscales: 1) positive interaction, 2) punitiveness, 3) detachment, and 4) permissiveness. A study by Ghazvini (2002) indicates these same 26 items are organized into three subscales: 1) sensitivity, 2) punitiveness, and 3) detachment. Studies conducted by the Keystone University Research Corporation (2001), utilize 37 items, organized into four subscales: 1) sensitivity, 2) harshness, 3) detachment, and 4) permissiveness. This variation in the measure makes any comparison of data very difficult.

2.2.4 Limited variability of the CIS. Both research and technical assistance require an instrument with greater ability to assess the areas of caregiver strength and weakness. Research by Fiene (2006) found the Arnett CIS was effective at discriminating between really good and really poor care, however it was not able to discern the finer gradients of high quality care. As such, there were many mediocre programs mixed in with good programs. For research, a more fine-tuned measure would enable us to learn more about the characteristics of the caregiver/child interaction, which remains critical for quality child care. For technical assistance, a more variable scale would allow for greater identification of targeted interventions designed to modify or improve specific behaviors.

3. The Child Caregiver Interaction Scale (CCIS) (Carl, 2007, 2010)

3.1 How the CCIS addresses the limitations of the CIS

3.1.1 Recent research on Developmentally Appropriate Practice in early care and education. The National Association for the Education of Young Children invested much time, energy and resources into the creation of their eight principles of developmentally appropriate practice. These principles are based on a solid theoretical and research base. It seems logical that any child and caregiver interaction assessment measure should be viewed through the constructs of the cognitive, social/emotional, and family/cultural competence domains.

3.1.2 Review of Developmentally Appropriate Practice (DAP) and Theoretical Base. DAP is based on the following three kinds of information and knowledge:

1. What is known about child development and learning – knowledge of age-related human characteristics that permit general predictions within an age range about what activities, materials, interactions, or experiences will be safe, healthy, interesting, achievable, and also challenging to children;
2. What is known about the strengths, interests, and needs of each individual child in the group to be able to adapt for and be responsive to inevitable individual variation; and
3. Knowledge of the social and cultural contexts in which children live to ensure that learning experiences are meaningful, relevant, and respectful for participating children and their families (NAEYC, 2009; Bredekamp, 1997, p. 9).

The developmentally appropriate practice principles have roots in three main theoretical perspectives: Constructivism (Piaget, 1952, Vgotsky, 1978), Ecological Systems Theory (Bronfenbrenner, 1979) and Attachment Theory (Bowlby, 1969; Ainsworth, et al, 1978). An extensive review of the twelve principles and theoretical perspectives found them to be interrelated.

The CCIS is grounded on the solid theoretical base of DAP and is structured to incorporate these principles. Because of the more recent research on child development that stresses brain development, caregiver interaction, and the changing cultural composition of children in care, more current literature, such as DAP, suggests that the standards of the CIS be updated. This position is in agreement with Moss (1994) who argues that early childhood program quality is a relative concept, not an objective reality, and that definitions change over time. As such, quality must be continually redefined.

4. The Present Study

4.1 Sample

Participants for this study include 97 infant, toddler, preschool and family home child care providers. This sample was one of convenience, with caregivers being recruited based upon their voluntary willingness to undergo an observation by a CCIS trained assessor. The majority of observed caregivers were women ($n = 95$) and the median age was 32.5 years. Caregivers in the sample identified as European American (64%), African American (23%), and Latino (13%). The education level of participants ranged from those with a high school degree or GED (9.4%), CDA or Associates degree (30.2%), Bachelor's degree (51.0%), to Master's degree (9.4%).

All child care providers in this study also participate in the Keystone STARS Quality Improvement Initiative. This initiative is administered through the Pennsylvania Office of Child Development and Early Learning (OCDEL) as part of their child care Quality Rating and Improvement System (QRIS), whose goal is to improve, support, and recognize the continuous quality improvement efforts of early learning programs in the Commonwealth (<http://www.pakeys.org>). Study participants included those that were Star 1 (6.3%), Star 2 (11.5%), Star 3 (30.2%), and Star 4 (52.1%).

4.2 Methods

A team of six data collectors were reliability trained on the CCIS measure. Data collectors attended a four hour workshop on the CCIS. Prior to conducting independent observations, each data collector was required to conduct two onsite reliability observations with a reliability trained observer, scoring within 85% in agreement.

Study participants were invited to participate in the research study by an email invitation. Beginning in the fall of 2012, caregivers throughout the Central Pennsylvania area were recruited to participate in this study. The incentive to participate were the written results of the CCIS observation, highlighting both areas of strengths and those most in need of improvement. Data collection protocol was approved by the University Institutional Review Board and informed consent was received from every study participant. Data collection occurred between January and April 2013. Each child caregiver included in this study was observed for one approximately three-hour period of time.

4.3 Measures

The CCIS-Revised Edition (2010), consists of 14 items, 168 indicators, representing three domains: Emotional, cognitive/physical, and mesosystems support. Each item is comprised of numerous indicators. Each of these indicators operationally defines specific actions that comprise that score. Either the behavior is present or it is not. This method removes much of the subjectivity in scoring. Each item is presented as a 7 point scale with detailed criteria at four anchor points: 1 (inadequate), 3 (minimal), 5 (good), and 7 (excellent).

4. Results

In order to examine the capacity of the CCIS in assessing the quality of child caregiver interactions, extensive data analysis occurred. First, exploratory factor analysis was conducted to determine how well correlated each of the items in the scale were to one another. This was followed by factor analysis to determine the feasibility of subscale identification. Because variability of scores was a limitation of the Arnett CIS, variability of participant scores was examined. Construct validity was assessed by examining the CCIS scores and the STAR level of the center, as well as the education level of the caregiver. Finally internal consistency of the measure was examined by looking at utility across age groups and settings.

5.1 Correlational Analysis

In order to determine if the 14 items in the CCIS are separate and distinct, correlational data analysis was conducted. Preliminary correlational data analysis of study participants revealed a value of 0.0001900, which is greater than the necessary value of 0.00001, therefore multicollinearity is not a problem for this data (Field, 2005). Because each of the items correlate well and there are no large correlation coefficients, we chose to retain all the proposed items. Further, the Kaiser-Meyer-Olkin statistic was .857, indicating that factor analysis should identify distinct and reliable factors. According to Kaiser (1960), values between 0.8 and 0.9 are great so we can be confident that factor analysis is appropriate for this data.

5.2 Subscale Identification.

Based upon correlational analysis and the original theoretical hypothesis that child caregiver interaction is comprised of three factors, emotional, cognitive, and social, exploratory factor analysis of the CCIS was conducted. Analysis of 97 caregivers resulted in common variance, which accounted for 74.3% of the item variance. Upon further analysis, using the principle component analysis extraction method, three factors were identified. The table below articulates these findings.

INSERT TABLE 2: *CCIS FACTOR ANALYSIS* ABOUT HERE

While the majority of the items loaded on Factor 1, these results identified items #12 Arrival and #14 Relationships with Families to be Factor 2, and #5 Health and Safety to be Factor 3. Based upon this analysis and after an inspection of the scree plot results, it was determined that the CCIS inductively consists of one major factor, that of Child Caregiver Interaction, and another that relates to Family Interactions. While the analysis did suggest a statistical difference in Health and Safety, according to Preacher and MacCallum,

Because common factors are defined as influencing at least two manifest variables, there must be at least two (and preferably more) indicators per factor. Otherwise, the latent variable merely accounts for a portion of the unique variance, that variability which is not accounted for by common factors (2003, p. 27).

In contrast, theory suggests the existence of three factors that influence the quality of child care (emotional, cognitive, and social). Data analysis from the current study did not confirm that premise, but rather indicated the existence of one general factor that is comprised of aspects of the three theoretical components. However, Pearson Correlations of the proposed subscales indicated significant relationships among the three domains. These results clearly show that a person who scores high in one domain is more likely to score high on the other two domains as well. Given the strong theoretical overlap between the original proposed factors, these results are not surprising.

Although these areas of child development tend to overlap each other, the literature and research presents a strong theoretical justification for the existence of the subscales. In support, the Alpha Coefficients for each of the subscales were sufficiently high in terms of internal consistency, ranging from .602 to .952. While the factor analytic procedure provided an inductive analysis of the data, the available theory and current body of research strongly supports a deductive decision to consider the existence of all three subscales or domains. This is especially true from a training and technical assistance standpoint.

5.3 Variability of Scale

The Arnett CIS (1989), as experienced by practitioners and program managers, was the lack of variability with assessment items. The measure uses a four point, Likert scale (1 = Never, 2 = Few, 3 = Some, 4 = Many). In practice, this scaling tended to result in a polarized assessment indicating either high or low scores. This scaling is arbitrary and not built on a solid research foundation of scale and measurement. While the measure is effective at assessing either really good, or really poor caregivers, it does not allow for the distinction of caregivers who fall in the mid range of effectiveness.

The CCIS was created using a 7-point interval-like scale to offer an instrument with greater precision to assess the areas of caregiver strength and areas of improvement. The CCIS was also carefully constructed in terms of the current DAP body of knowledge. This dual approach to construction yielded an assessment measure that produced assessments that were normally spread, versus the polarized or bimodal results realized through the CIS.

The scoring methodology below was chosen for the CCIS. The following table graphically identifies the categories of care:

INSERT TABLE 3: *CCIS Scoring* ABOUT HERE

This scoring approach was chosen for several reasons.

Numerous indicators comprise each CCIS item. Each of these indicators operationally defines specific actions that comprise a score. Either the behavior is present or it is not. In combination with training, this method removes much of the subjectivity in scoring. The CCIS consists of 14 items organized into the three aforementioned domains (emotional, cognitive/physical, and social).

- Each item is presented as a 7-point scale with detailed criteria at four anchor points: 1 (inadequate), 3 (minimal), 5 (good), and 7 (excellent).
- This type of scoring is familiar to researchers and practitioners alike. It is used in the (Infant/Toddler Environmental Rating Scale, Revised Edition (ITERS 3) (Harms, T., Cryer, D., Clifford, R. M., & Yazejian, N. (2017) , Early Childhood Environmental Rating Scale, Revised Edition (ECERS 3) (Harms, T., Clifford, R. M., & Cryer, D. (2014), the School-Age Care Environment Rating Scale (SACERS) (Harms, Jacobs, and White, 1996), and the Family Day Care Rating Scale (FDCRS), (Harms, T., Clifford, R.M., and Cryer, D. (2003),

Each of the subscales and the CCIS overall scores followed bell shaped distributions thereby providing support that the CCIS does a good job of measuring the full spectrum of observed caregiver interactions under assessment. The results from the CCIS demonstrated measurement variability, which is a noteworthy improvement over the polarized Arnett CIS.

5.4 Construct Validity

For purposes of this analysis, the factors of education, STAR level, and child caregiver interaction were explored using multiple regression. For the purposes of this analysis, the STAR level of the child care facility was chosen for assessing construct validity because other research studies indicate a positive correlation between the STARS ranking and quality of care. Construct validity was also assessed by exploring the relationship between scores on the CCIS and the education level of the child care provider (Fiene, et al, 2002, Fiene, 2006).

Because of the research and theoretical foundation of the QRIS, we expected the STAR level to be a significant predictor of child caregiver interaction. Using a hierarchical model, we entered this variable first, followed by the educational level of the caregiver. Results of the multiple regression analysis indicate the QRIS level of the provider accounts for 73.2% of the variation in child caregiver interaction and increases to 78.5% when adding in the education level of the provider. The adjusted R square in our model is close to the R square which means if the model were drawn from the population rather than the sample, it would account for a fraction of the variance in the outcomes. Further, the Durbin-Watson statistic is 2.105, which leads us to believe that the assumption of independent errors has been met.

INSERT TABLE 4: *QRIS Level and Education as Predictors of Child Caregiver Interaction Scale Score* ABOUT HERE

5.5 Internal Consistency: Utility Across Age Groups and Settings

Most caregiver interaction scales remain limited to specific age groupings and therefore do not cover the age spectrum found in most child care facilities. Given the International, National and State level focus on child care quality improvement, a need exists for an instrument that can monitor, evaluate, and assess the quality of child caregiver interactions at multiple age groupings and settings, ranging from infancy through preschool, as well as family child care homes. Analyses of each age grouping and setting are presented below.

5.5.1 Analysis of CCIS for all age groupings and settings: As was expected, the CCIS proved to have high internal consistency across age groups and settings. Cronbach's alpha for the CCIS measure, across all age groups and settings was extremely high, at .925 (N = 96). The overall CCIS score for infant, toddler, preschool and family child care providers revealed a mean of 4.47, with a range of 1.93 to 6.92.

5.5.2 Analysis of CCIS for infant age caregivers. For the purposes of this research study, infant caregivers are defined as those providing care to babies between the ages of 6 weeks to 12 months. The overall CCIS score for the infant age group providers (n = 14) revealed a mean of 3.52, with a range of 1.93 to 6.92. The value for Cronbach's alpha was .950 indicating high reliability with regard to internal consistency.

5.5.3 Analysis of CCIS for toddler age caregivers. For the purposes of this research study, toddler caregivers are defined as those providing care to children between the ages of 13 to 35 months. The overall CCIS score for the toddler only age group providers (n = 32) indicated a mean of 4.34, with a range of 2.20 to 6.91. The value for Cronbach's alpha was .916 indicating high reliability with regard to internal consistency.

5.5.4 Analysis of CCIS for preschool age caregivers. For the purposes of this research study, preschool caregivers are defined as those providing care to children between the ages of 36 to 60 months. The overall CCIS score for the preschool only age group providers (n = 40) revealed a mean of 4.77, with a range of 2.21 to 6.57. The value for Cronbach's alpha was .905 indicating high reliability with regard to internal consistency.

5.5.5 Analysis of CCIS for home based providers only. For the purposes of this research study, home based caregivers are defined as those providing care to up to five children in an at home setting. These are nonrelative caregivers. The overall CCIS score for home based providers only (n = 10) was a mean of 5.03, with a range of 2.36 to 6.21. The value of Cronbach's alpha was .90 indicating high reliability with regard to internal consistency.

6. Conclusion

The goal of this study and the CCIS was to improve upon existing measures of child and caregiver interaction, with the express purpose of creating a global assessment of the quality of caregiver interactions with children. This measure is theoretically grounded and research based, and closely aligned with NAEYC's Developmentally Appropriate Practice.

Both research and technical assistance require an instrument with greater ability to assess the areas of caregiver strength and weakness. For researching characteristics critical for quality child care, a more sensitive measure will enable us to learn more about the attributes associated with caregiver/child interaction. From a technical assistance perspective, a more sensitive measure will allow for greater identification of targeted interventions and behavioral considerations. Helping caregivers understand their strengths and areas of improvement can help assess practice. Because the CCIS is built on DAP, caregivers can have specific examples of how best they can provide for the children in their care.

The CCIS is a valuable and much needed measurement tool to assess child caregiver interaction across age groupings and settings. This measure not only provides a scale that can be used for research purposes to compare child care quality, but also serves as a noteworthy tool for training and technical assistance. By helping child caregivers understand their strengths and areas most in need for improvement, the CCIS is a tool that can be used to improve quality child care.

7. References

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8. Supplemental Tables

Table 2
CCIS Factor Analysis

	Component		
	1	2	3
6. Routines/Time Spent	.870	-.100	.002
3. Enjoys and Appreciates Children	.854	.031	.056
1. Tone of Voice	.843	.015	.105
9. Language Development	.837	.118	-.188
11. Involvement with Children's Activities	.824	.035	-.025
4. Expectations for Children	.806	.177	.126
8. Discipline	.753	.015	-.022
7. Physical Attention	.752	-.128	.227
2. Acceptance/Respect for Children	.746	.047	.336
10. Learning Opportunities	.707	.188	-.300
13. Promotion of Prosocial Behavior	.638	-.007	-.517
12. Arrival	-.063	.893	.031
14. Relationships with Families	.057	.855	.035
5. Health and Safety	.319	.117	.760

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.

Inadequate 1	2	Minimal 3	4	Good 5	6	Excellent 7
Negative or inappropriate behavior	or	Functionary or custodial care. (Available) Children's basic needs are met Licensing Requirements		Engaging (Accessible) Interactive Child takes the lead		Expanding Caregiver expands on child's interests.

	<i>b</i>	<i>SE b</i>	<i>B</i>
Step 1			
CCIS Average Score	.393	.264	
QRIS Level	1.244	.078	.855*
Step 2			
CCIS Average Score	.177	.239	
QRIS Level	.787	.114	6.905*
Education Level	.659	.131	5.044*