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Inner Experience and Self-Ratings of Inner Speaking

Jason Michael Kelsey
University of Nevada, Las Vegas, kelseyj3@unlv.nevada.edu

INNER EXPERIENCE AND SELF-RATINGS

OF INNER SPEAKING

By

Jason Michael Kelsey

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Russel Hurlburt, Ph.D.   Kathryn Hausbeck Korgan, Ph.D.
Examination Committee Chair   *Graduate College Interim Dean*

Chris Heavey, PhD.
Examination Committee Member

David Copeland, Ph.D.
Examination Committee Member

David Beisecker, Ph.D.
Graduate College Faculty Representative

ABSTRACT

Questionnaires are often used as measures of inner experience. This study questions the adequacy of such measures, using inner speech as an example. We compared two questionnaire measures of inner speaking to each other and to inner experience as apprehended by Descriptive Experience Sampling (DES, a naturalistic, high fidelity method of exploring inner experience). Undergraduate volunteers ($N = 260$) took two questionnaires designed to measure inner speaking: the Self-Talk Scale (STS) and the Nevada Inner Experience Questionnaire (NIEQ). A subset of these ($N = 16$) participated in DES to investigate their inner speaking with fidelity. Scores on the NIEQ and STS were strongly correlated. However, the correlations between either questionnaire and DES-apprehended inner speaking were near zero—questionnaire ratings of inner speaking grossly overestimated the frequency of inner speaking as found by DES. These results suggest that questionnaire responses may be based more on presuppositions about experience than on actually occurring experience, and suggest caution in using questionnaires to study inner experience.

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CHAPTER 1

INTRODUCTION TO INNER SPEAKING

Inner speaking is talking to yourself in your head, in words, silently. If asked "How frequently do you innerly speak?" some would confidently reply that they speak to themselves constantly. Others would say that they rarely or never innerly speak. Are such responses likely to be correct? What might be the characteristics of the inner experience of those who say they innerly speak frequently? Of those who say they innerly speak rarely?

The answer to "how frequently do you innerly speak" may be based not on a person's actual frequency of inner speaking but rather on a set of implicit and perhaps unacknowledged assumptions of inner experience (Hurlburt, Heavey, & Kelsey, 2013). Self-perceived frequency could be based on one or a few particular incidents that easily come to mind or occurred recently. Inaccuracy of frequency estimation might arise because the difficulty of remembering and categorizing events as numerous and transient as inner experiences.

This study seeks to apprehend and describe in high fidelity the inner experience of a sample of those who rate themselves high on a questionnaire measure of inner speaking, and of another sample who rate themselves low on the same measure. Using an ecologically valid way of discovering some basic characteristics of inner experience including inner speaking, we expect to shed light on the extent to which such questionnaire reports should be trusted. Nisbett and Wilson (1977), Hurlburt and Schwitzgebel (2007), and Hurlburt and Heavey (2015) suggest that this extent might be small.

This thesis has four sections. First, it provides historical perspectives and review of research in inner speaking, including research using questionnaires. Second, it provides a critical

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review of modern methods of experience sampling. Third, the procedure and methods used to investigate the research question are described. Finally the results and implications of the findings are discussed.

Background and characteristics of the phenomenon

Inner speaking, also known as inner speech, self-talk, inner monologue, subvocal speech, internal dialogue and self-statements (Morin, 2005), can be briefly defined as innerly speaking in a silent voice that could not be heard by an external observer, unaccompanied by observable muscular activity (Hurlburt, Heavey, & Kelsey, 2013). Inner speaking as a subject of study was not, for many years, considered a legitimate target of research. Behaviorism viewed any self-report of an inner experience as fundamentally unreliable, inaccessible, and unacceptable to psychological science. Skinner summed up this view of psychology: "In a given episode, the environment acts upon the organism, something happens inside, the organism then acts upon the environment. The first, third and fourth of these events is the field of the science of behavior…what happens inside is another part of the story" (Skinner, 1986).

As the influence of behaviorism waned and the "cognitive revolution" took hold, inner speaking as well as other so-called mental processes have again become targets of study. Currently, inner speaking has assumed a place of importance in psychology in general and clinical psychology in particular. Cognitive behavioral therapies often specifically target the inner speaking of those suffering from disorders (Ellis, 1976; Ishikawa et al., 2012). Inner speaking is thought to play a part in depression, social anxiety, and many other disorders including the auditory hallucinations in schizophrenia (Sanz & Avia, 1994; Allen, Aleman, & McGuire, 2007). Aside from psychopathology, inner speaking has been implicated in impulse

control and self-regulation of behavior (Morin, 1993), regulation of behavior in social situations (San Martín Martínez, Boada i Calbet, & Feigenbaum, 2011) and self-awareness (Morin, 2005). Notwithstanding its importance, inner speaking remains an under-researched topic (Morin, 2009).

Inner speaking as a phenomenon has been observed by philosophers and their psychologist successors at least from the time of Plato (Chiesa, 1991). French psychologists Egger (1881) and Ballet (1886) were the first to apply scientific methods of their day to the study of the characteristics of inner speaking. Egger, through observing himself, thought that inner speaking always accompanied his thinking. In his own words "At any moment, the soul speaks his thoughts internally" (Egger, 1881, p.1). Ballet (1886) agreed with Egger on this point and adds that inner speaking is an essential part of the act of reading. He thought that whenever words are read, we innerly spoke the words as a part of the reading process. Although Egger and Ballet were in agreement, the use of introspective techniques by other researchers in later studies would lead to conflicting theories, as investigators described their own inner speaking and arrived at different conclusions (Sokolov, 1971).

One of the early writers on the topic of inner speaking was Lev Vygotsky. His nearly-century-old writings on inner speaking continue to influence research in the present day (e.g., Jones, 2009; San Martín Martínez, Boada i Calbet, & Feigenbaum, 2011; McCarthy-Jones & Fernyhough, 2011). Vygotsky saw inner speaking as being part of the natural progression of learning language (Vygotsky, 1934. According to Vygotsky, language is necessarily an expressive act involving a dialogue between two people. Children first learn to speak expressing themselves to others and then learn to speak to themselves out loud (egocentric speech). Inner

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speaking is the subsequent internalization of egocentric speech. Vygotsky did not see inner speaking as simply speech minus the sound but as a unique phenomenon possessing its own characteristics. First, because of its "dialogic" origins, inner speaking reflects a conversation with the self; as a result, the presence of other voices in the inner speaking is to be expected. Second, Vygotsky described inner speaking as possessing the characteristics of "predication," the speaking of a predicate without speaking the subject, which would be redundant because the subject is (obviously) known to the inner speaker and implied by the predicate. For example, the speaker may innerly speak "bad" while meaning "the food is bad." The subject (food) is absent in the inner speech, but is understood as present by the inner speaker. He viewed this condensation of inner speaking as an essential part of the "syntax" of inner speaking. Third, Vygotsky considered word "sense" (the sum of all our experiences with the word) to take precedence over word "meaning" (its simple definition) in inner speaking. These word senses also freely flow into each other and influenced one another, even combining to form new senses in a process he called "agglutination" (Vygotsky, 1986; Ehrich, 2006).

Jean Piaget proposed a different theory for the origin of inner speaking. When children initially acquire speech, it tends to be egocentric only (addressed to the speaker). As children mature, they become more aware of others and engage in social speech, thus losing speech's egocentricity. As they develop and become socially aware of others, they eventually learn to keep silent the thoughts that previously would have been verbalized. These internalized egocentric thoughts become inner speaking (Oates, Wood, & Grayson, 2005, Frawley 1997) Whereas Piaget's theory proposed that egocentric speech is the first step in developing social speech, and that inner speaking is an internalized holdover from an earlier developmental period,

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Vygotsky held that egocentric speech developed secondarily from social speech, retained its characteristic of a two person conversation (dialogicity), and represented a unique phenomenon.

Many have theorized about the particular characteristics of inner speaking. Whereas Vygotsky thought that it was dialogic, Frawley (1997) held that inner speaking, as "the language for thought, gives the appearance of communication, but in fact is more like pure broadcasting than the conveyance of information" (Frawley,1997, p.178). Descriptive Experience Sampling (DES) investigations into inner experience have described characteristics of inner speaking. In the typical inner speaking experience, people apprehend themselves to be speaking normally, in their natural voice, without the production of external sound. The speaking is usually (but not always) in complete sentences, in contrast to Vygotsky's claim of nearly constant predication (Hurlburt, Heavey & Kelsey, 2013). Like external speaking, inner speaking can carry the full range of emotion and communicative nuance. Inner speaking can be inflected to express happiness, excitement, anger, annoyance, etc. Inner speaking can be addressed to another person, but it has also been observed to be spoken to nobody in particular, similar to what was noted by Frawley (1997). Furthermore, inner speaking is distinguished from "inner hearing" as being an experience of active production, rather than a passive, receptive experience (Heavey & Hurlburt, 2008; Hurlburt, Heavey & Kelsey, 2013).

DES has found that inner speaking is not a uniform phenomenon. There exist significant variations in experiences that can be called "inner speaking." Inner speaking can be experienced (although not necessarily so) as originating from a particular part of the body such as the head or the chest. Multiple inner speakings expressing simultaneous but disparate content can occur (although not frequently), and that simultaneity can be with other inner speakings or with speaking aloud. Inner speaking has also been observed to be "partially worded" or having only a

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portion of the words present but flowing in an unimpeded way (Hurlburt, Heavey & Kelsey, 2013). This is similar to the "predication" described by Vygotsky (1986); however DES frequently finds any word in a sentence can be missing, not only subjects. Furthermore, "unworded speaking" has been observed by DES, where people experience themselves as speaking but where no words are present.

There are widely different opinions as to the frequency of occurrence of inner speaking. Many authors hold that inner speaking occurs constantly or nearly so (Agnati et al., 2012; Baars, 2003; Archer, 2000). Hurlburt and Heavey, using the Descriptive Experience Sampling (DES) method to investigate the phenomenon, found inner speaking to occur in 23% of the samples when averaging the data across two studies (Hurlburt & Heavey, 2008; Mihelic, 2010). However, there were dramatic individual differences between people, with some having no instances of inner speaking, others having nearly constant inner speaking, and others arrayed in between (Hurlburt, Heavey & Kelsey, 2013).

Modern research into inner speaking

Many theories of the functions of inner speaking and its role in consciousness has been advanced. Martines-Manrique and Vicente (2010) theorized that inner speaking was the medium by which our thoughts were brought to consciousness. That is, we become aware of and able to handle our own thoughts because we talk to ourselves about our thoughts. In their theory, inner speaking could be unworded or partially worded because we have much contextual information about ourselves and therefore do not need to elaborate (an explanation similar to Vygotsky's predication). Bermúdez (2003) proposed that although we have many different kinds of thoughts

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and can be aware of them in their original forms (e.g., feelings, images, etc.), the only way that we are able to think about our own thoughts is to use inner speaking. According to Bermúdez, to attempt to think about our own thoughts without inner speaking is a prohibitively demanding cognitive process; the use of an internal language allows us to work with, manage, and examine thoughts. Prinz (2003, 2007) thought that inner speaking represented an "intermediate level" between unconscious information of a highly abstract sort and unconscious information of a concrete, mainly perceptual nature. Inner speaking is the way that information of both kinds are brought into awareness and represented. Carruthers (2002, 2006) held that the mind is composed of many different subsystems and that inner speaking comprises a common language between them. Because the "language processer" includes both receptive and expressive functions, it is well suited to this task. Through the medium of inner speaking, the mind is able to integrate information from various different sources.

The results and theories we have discussed so far rely primarily on introspection and questionnaire methods of studying inner speaking. In addition, however, researchers have used a variety of performance-based methods to study inner speaking in various populations. It is of note that many of these studies assume that handling linguistic information silently implies the use of inner speaking, when this may not be the case (Hurlburt, 2011).

Morin, Uttl and Hamper (2011) used an open thought-listing procedure (simply writing down what one thinks) to investigate the inner speaking in a sample of 380 undergraduates. They then coded the listed thoughts into specific categories of function and topic. The investigators found that people most frequently address inner speaking to themselves (self-referential activity), and that the most common topics and functions of this was self-evaluation (e.g., appearance, performance in a social context, etc.). When the speaking was addressed to others, the most

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frequent targets of inner speaking were those close to the participant, such as a family member or friends. Frequent content involved the future and presently occurring events. Morin and colleagues highlight the limitations of the thought listing procedure, namely the possibility that non-inner speaking content may be listed and the retrospective nature of the data collection.

Whitehouse, Mayberry, and Durkin (2006) theorized that there may be deficits in inner speaking in autism. To test this, they compared a group of 20 autistic children with a group 20 controls on three different tasks measuring inner speaking. The tendency for pictures to be recalled better than words is known as the *picture superiority effect*. One theory behind this is that pictures require visual processing as well as inner speaking, whereas words require inner speaking alone. If those with autism have deficits in their inner speaking, they should show less of a picture superiority effect in their recall. In the first experiment, they had the two groups complete a task that required them to remember a series of pictures that were presented to them as well as a series of words. Those in the autistic group showed a significantly weaker picture superiority effect than did those in the control group. In the second experiment, they tested inner speaking use by looking at the *word length effect*, which is the tendency for shorter words to be remembered better than longer words. The investigators presented both groups a list of long words and a list of short words with the instructions to read them silently. Memory for both word lists were tested, and the autistic group did not show as strong a word length effect as did the control group. The investigators interpreted this as evidence that inner speaking was not used in the task in the autistic group to the same extent that it was used by the controls. In the third experiment, the two groups performed a set switching math task with and without *articulatory suppression* (in addition to the task saying the months of the year to suppress inner speaking). The investigators considered inner speaking to be an essential part of the task, and that

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articulatory suppression should affect performance. The investigators found that articulatory suppression impeded the performance of the control group but did not significantly affect the performance of the autism group.

Lidstone, Meins, and Fernyhough (2010) similarly used articulatory suppression to interfere with the production of inner speaking during the performance of a task that involved planning (the Tower of London test) to investigate the role of inner speaking in planful activities. They had a group of 30 normally developing 7-10 year olds perform the test first with articulatory suppression (repeating the word "Monday" constantly) and then with a foot tapping task as a control. There were no significant differences between the articulatory suppression and the foot tapping conditions. The authors theorized that perhaps simply doing the puzzle did not evoke significant planning sufficient for an effect. In a second experiment, the investigators required the children to announce their moves before they made them; they found that articulatory suppression produced poorer performance on the test when compared to the foot tapping control. The author interpreted this data as indicating that performance on the Tower of London test was dependent on inner and self-directed speech.

Geva et al. (2011) studied the relationship between inner speaking and aphasia developing after a stroke. They administered a battery of three inner speaking tests to 27 aphasic stroke patients and to a group of 27 controls. The first test required the participants to judge if two words rhymed or not (e.g., *bear* and *chair*). The second required the participants to judge if two words were homonyms (e.g., *might* and *mite*). The third required the participants to judge if a series of non-words rhymed (e.g., *zoal* and *zole*). The participants completed each of these tests reading the words out loud as well as silently (with the intent of testing their inner speaking abilities). Geva et al., found that across the stroke patients there was a wide spread of abilities

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and disabilities. Most individuals had similar performances on both spoken and inner speech tasks. However, some individuals with disturbed external speech had intact inner speaking abilities, whereas others had the opposite pattern.

Corollary discharge is a prediction that the brain makes of the sensory feedback that might be expected from any particular movement. By predicting this, this feedback is able to be filtered out with the purpose of avoiding sensory confusion. Scott (2013) held that inner speaking is a sort of corollary discharge——a prediction of sensory feedback of one's own voice. If inner speaking is in fact corollary discharge, it should have an inhibitory effect on hearing. To test the inhibitory potential of inner speaking, Scott used the *Mann effect,* a phonetic context effect where a preceding vowel-consonant influences a following ambiguous consonant-vowel syllable. Consider, for example, the syllable *gha*. The syllable pair *ar-gha* sounds like *ar-da*, whereas the syllable pair *al-gha* sounds like *al-ga.* That is, the second syllable (*gha*), while objectively identical in both situations, is heard differently (as *da* or *ga*). In actuality, *gha* is neither *da* nor *ga,* but is perceived differently depending on what precedes it. If indeed inner speaking is corollary discharge, than inner speaking should attenuate the effect of the proceeding syllable's influencing the second syllable. There were three conditions in the study. In the first condition, participants listened to a recording of a context syllable and then repeated it mentally. In the second condition, participants listened to a context syllable with no mental repetition. In the third condition, the participants listened to a recording of a context syllable and then repeated a different context syllable mentally. Scott found that the context effect was weaker in the group that repeated the same context variable mentally and interpreted this as evidence that inner speaking is a subset of corollary discharge.

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Various neuroimaging studies have investigated the neurological correlates of inner speaking and related processes and have found various patterns of brain involvement in a variety of tasks. There has been some lack of agreement as to what brain regions are associated with inner speaking, and this may be due to the heterogeneity of methods used (Perrone-Bertolotti, 2014) and because the use different tasks can significantly affect the resulting patterns of brain activation (Shergill et al., 2000). Areas most frequently found to be associated with inner speaking are Broca's and Wernicke's areas in the left hemisphere (Huang, Carr, & Cao, 2002; Ojemann et al., 1998; Newman & Twieg, 2001). A typical example of a neuroimaging study investigating inner speaking is Shergill et al. (2001). Shergill et al. used fMRI to compare a group of patients with schizophrenia to a group of healthy controls when they repeated a given phrase silently. They found left-side activation in the inferior frontal gyrus (Broca's area), precentral gyrus (primary motor cortex), superior temporal gyrus (Wernicke's area), and lingual gyrus (an area associated with letter recognition). Activation was also observed in the supplementary motor area as well as the right posterior cerebellar cortex. They did not find differences in the pattern of activation between the schizophrenia patients and the control group when they were engaged in the inner speaking task. McGuire, Silbersweig, and Frith (1996), in a PET study of reading, found no difference in activation between reading aloud and reading silently while listening to another voice read the same passage. In an fMRI study by Xiao et al. (2005), participants read words and nonsense words silently (in Chinese); the researchers found that although the patterns of activation were very similar between the two tasks, the left inferior frontal gyrus (Broca's area) was significantly more activated in the nonsense word condition.

Questionnaire methods of studying inner speaking

Siegrist (1995), in investigating the link between self-talk and self-awareness, developed the Scale for Inner Speech (SIS). The SIS is a 19-item questionnaire with items being rated on 6-point Likert scales. The SIS does not distinguish between self-talk and inner speech, but rather gives the instructions that "self-talk can either be spoken out loud or be only formulated in our thoughts" (Siegrist, 1995). Thus, inner speech may be included in the broad category of "self-talk" but is not specifically targeted. Siegrist found that the SIS was positively correlated with a measure of self-consciousness and negatively correlated with a measure of self-deception. This questionnaire has not been used in any other studies.

Burnett (1996) developed the Self Talk Inventory (STI) by first asking a sample of elementary school students (4th to 7th grade) what they would say to themselves in ten different situations (e.g., "you have just received a really good mark on your math test"). The responses were classified into positive, negative, or neutral responses. The three most common positive and the three most common negative responses for each of the situations were included in the questionnaire. Respondents indicate how often they say each of the 60 statements to themselves in each of the imagined situations by endorsing *Yes*, *Sometimes*, or *No*. This instrument does not distinguish between inner speech and audible self-talk (using the ambiguous instruction "say to yourself"), and has been used in four studies, all with adolescents in a classroom setting. Burnett (1996) used this instrument to examine the relationship between self-talk as measured by the STI and the perceptions of positive and negative statements made by significant people in the children's lives (parents, teachers, etc.). This study used a sample of 675 elementary school

students ages 7-13 and found that children who perceived that their significant others spoke positively about them had a higher amount of positive self-talk and lower negative self-talk as measured by the STI. Additionally, children who perceived that significant others spoke negatively about them tended to score higher on negative self-talk and lower on positive self-talk than did the first group.

Calvete and Cardeñoso (2002) used a Spanish version of the STI to investigate the relationship between positive and negative self-talk and psychopathology as measured by the Youth Self-Report (YSR; Achenbach, 1991) in a sample of 856 students aged 13-17. They found that high amounts of self-talk (especially negative self-talk) as measured by the STI was associated with high scores on the internalizing disorders subscale of the YSR, but found no other relationships.

Burnett (2003) used a modified version of the STI to study the relationship between teacher feedback and elementary school (3rd to 6th grade) students' self-talk in the context of their opinions of themselves as it related to reading and mathematics. The situations used in the questionnaire were modified to reflect self-talk in reading or math situations that would be encountered in school. Burnett found that students endorsing a pattern of high positive self-talk and low negative self-talk perceived their teachers as providing a high amount of ability-related feedback (e.g., "you have an ability to do math) and that those endorsing a pattern of high negative self-talk perceived their teacher as providing a high amount of effort related feedback (e.g., "you are working very hard right now").

Calvete and Cardeñoso (2005) investigated the relationship of gender and vulnerability to depression and behavior problems in adolescents, specifically the increased risk of depression for

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females and increased rates of externalizing problems for males. In this study, the STI was used as a measure of automatic thoughts rather than a measure of self-talk or inner speech specifically. The study used a sample of 856 adolescents aged 14–17 and explored the relationship between irrational beliefs, social problem solving, and measures of problem behaviors using a variety of instruments. Calvete and Cardeñoso found that female adolescents had lower levels of positive thinking, higher levels of negative problem orientation, higher need for approval and success, and a higher amount self-focused negative thoughts (as measured by the STI). Males scored higher on measures of justification of violence, and endorsed a high level of careless and impulsive problem solving behavior.

The Self-Talk Use Questionnaire (STUQ; Hardy, Hall, & Hardy) is a 59-item questionnaire developed primarily for studying self-talk use by athletes. Aiming to be descriptive, it asks questions designed to assess the content of athletes' self-talk, the reasons that they talk to themselves, when they talk to themselves, and so on. It is of note that the STUQ includes items that specifically ask if self-talk occurs as out loud self-directed speaking or silent inner speaking. An abbreviated version of the STUQ has also been examined to determine its internal consistency and its test-retest reliability. Of the 24 items examined, 22 had good internal consistency and test retest reliability (Hardy, Hall, & Hardy, 2005). The STUQ appears in only these two papers.

The Varieties of Inner Speech Questionnaire (VISQ: McCarthy-Jones & Fernyhough, 2011) is a questionnaire that focuses exclusively on inner speech. It is an 18-item questionnaire that was developed on a sample of 235 college students. Respondents rate their agreement with statements such as "I talk back and forward to myself in my mind about things" on 6-point scales between *certainly does not apply to me* and *certainly applies to me*. The VISQ is designed to

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measure Vygostskian characteristics of inner speech such as dialogicity, condensation of the words, and the presence of other people's voices in inner speech. It has been used only in the article in which it was published.

The Self Talk Scale (STS; Brinthaupt, Hein, & Kramer, 2009) is a 16-item scale in which respondents rate the frequency in which they engage in self-talk in certain situations (e.g., "I talk to myself when I should have done something differently") on 5-point scales that range from *never* to *very often*. This scale was developed on a sample of 207 college students and includes instructions that define self-talk as "out loud or in your head." That is, it specifically includes inner speech as well as audible self-directed speech but does not distinguish between them. Besides the paper in which it appeared, the STS has been used in two studies.

Reichl, Schneider, and Spinath (2013) used a German language version of the STS to investigate the relationship between loneliness, the need to belong, mental and physical health, and self-talk in a sample of 559 adults, finding that higher self-talk as measured by the STS was associated with elevated scores on scales measuring loneliness and the need to belong. Additionally they found that reported poor health was associated with higher degrees of reported loneliness and self-talk.

Brinthaupt and Dove (2012) used the STS to study the differences in reported self-talk as a function of the participants' age, sex, if they had siblings or not, and if they reported having an "imaginary friend" as a child. They found that, overall, males reported on the STS more self-talk than did females, only children reported more self-talk than did those with siblings, and those who reported having imaginary friends had a higher level of self-talk. Among the age groups, those 21-30 years old reported the highest amount of self-talk, followed by the 41-54, 31-40, and

18-20 year old age groups. It is of note that the finding of males' reporting more self-talk is similar to the finding of Heavey and Hurlburt (2008) which found a higher amount of inner speech in males than in females.

Brinthaupt, Hein, and Kramer (2009) tested the construct validity of the STS by taking the upper and lower quartile of a sample of respondents on the STS and administering the Padua Inventory of Obsessive Compulsive Tendencies (Sanavio, 1988) and a measure the Need for Cognition Scale (Cacioppo & Petty, 1982). The authors theorized that as obsessive compulsive disorder is associated with negative self-talk, those scoring high in obsessive compulsive tendencies should also score high on the STS. Likewise, the Need for Cognition Scale is a measure of how much effortful cognitive activities are enjoyed. The authors theorized that because self-talk is associated with thinking and problem solving, those reporting greater amounts of self-talk should score highly on the STS as well. They found, as predicted, that scores on the STS were correlated with scores of obsessive–compulsive tendencies (high group mean=51.21, low group mean = 32.14, Cohen's *d*; .80) and scores of enjoyment of effortful cognitive activities (high group mean = 23.67, low group mean = 10.55, Cohen's *d*; .64). This indicates good construct validity. The STS has also been shown to have substantial stability: two administrations three months apart were positively correlated (*r* = .66; Brinthaupt, Hein, & Kramer, 2009)

The present study aimed to compare self-ratings of inner speech from a questionnaire source with inner speech observed with DES. Among the reviewed questionnaires, the STS is most appropriate for this purpose. First, although it does not distinguish between inner speech and self-talk, it specifically includes inner speech. Second, it was developed using adult college students (not athletes as the STUQ or children as the STI) and will be a better fit for our college

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student sample. Third, the STS appears the most frequently in the literature and has been used in a similar research capacity.

The Nevada Inner Experience Questionnaire (NIEQ; Moynihan et al., 2015) is a 20-item questionnaire designed specifically to inquire about experiential characteristics discovered by DES, including inner speaking. Created for use in this series of studies, the NIEQ inquires about the five kinds of inner experience that DES studies frequently find (inner speaking, inner seeing, feelings, sensory awareness, and unsymbolized thinking), asking respondents to rate the frequencies of these phenomena in their own inner experience and in the frequencies of people in general. Responses are recorded on ten point visual-analog scales between *never* and *always* or between *none* and *all*. This questionnaire is specifically focused on inner experience only (as opposed to the STS which although specifically including inner speaking, also includes audible speech).

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CHAPTER 2

METHODS OF STUDYING INNER EXPERIENCE

The prospect of studying human experience is fraught with concerns and difficulties, so the strengths and weaknesses of each method of apprehending inner experience must be considered carefully in the context of the research question. This section explores some methods that have been used to study inner experience and weighs their appropriateness for the current study.

Diary methods

Written narratives recorded in dairies are often used to study inner experience. These methods have been used to study the inner experience of discrete events, types of inner experience and general characteristics of inner experience across broader periods of time (Bolger, Davis, & Rafaeli, 2003). Participants are asked to keep a written record of their thoughts, actions, or in some cases the presence or absence of specific types of inner experience. Diary methods may record information free form (e.g., Bartlett, 2012) or use a specific framework of questions to record experience (e.g., Hedges et al., 1990; Mackinnon et al., 2014)

Fixed schedules, variable schedules, and event contingent schedules are often used in diary studies. In fixed schedules, participants record their experience at a particular pre-agreed upon time. Examples include completing the diary entry every evening at 8:00 pm, or continually checking in every 5 minutes to record your experience. A diary method using a variable schedule requires the participant to record their experience at randomly indicated times, usually signaled by a beeper or a similar device. In event contingent schedules, the participants record their experience when a particular event or phenomenon of interest occurs (e.g., in a study of anger,

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the participant records whenever she feels angry; in a study of eating, the participant records whenever she eats, etc.). For studies that aim to apprehend inner experience as undisturbed as possible, random schedules are preferred. The use of a random schedule keeps the participants from disturbing their experience by anticipating the moment of interest: they may behave or think differently because they know that they will be asked to record what they were doing. Assessing inner experience at a random moment may help to reduce bias in reports by keeping the participant from anticipating the recording and thus disturbing the content of the experience (Bolger, Davis, & Rafaeli, 2003).

There are two primary ways of recording diary data. The older and more common method is with paper and pencil. One strength of this approach is that most participants are already familiar with how to use these methods and do not require much training (the procedure does not differ much from a standard questionnaires or simple writing). The equipment is simple to use and inexpensive. One of the downsides of using physical paper and pencil methods is compliance with the study protocol: the participant must remember to use the booklet. Besides honestly forgetting to use the diary, some participants may be tempted to misrepresent how well they have complied with the experimenter's protocol (e.g., filling out a whole week's worth of diary entries at one time) to avoid embarrassment. If paper and pencil methods are used to record diary entries, it is not possible to monitor compliance with the method (Ellis-Davies et al., 2012). The second method of recording diary entries is with electronic devices. Electronic data storage devices are very versatile and can be configured to prompt participants to use the diary, as well as monitor usage and compliance. There is evidence that electronic methods yield better quality data and have a higher rate of compliance than do paper and pencil methods. Participants may

also prefer to use electronic methods (Allena et al., 2012). They are, however, more expensive than paper and pencil methods (Lam et al., 2010; Ireland et al., 2012).

Clinically, diary methods have been used as an intervention, and have been shown to produce positive therapeutic effects (Hymer, 1991) in the treatment of conditions as diverse as sexual concerns (Harvey, 2011), chronic pain (Kristjánsdóttir et al., 2013; Maikler et al., 2001), weight loss and diet (Carter et al., 2013; Zepeda, & Deal, 2008), and coping with stress (Devonport & Lane, 2014). One reason that they are so widespread is their ease of use and adaptability to most situations provided the participants are willing and able to complete the diary task.

Diary methods have strengths and weaknesses when used to investigate inner experience. The open ended / unstructured nature of some kinds of diaries allows for the freedom to record one's personal feelings and experience in an unconstrained way. More specified methods, such as traditional questionnaires, may artificially impose a structure that does not reflect the participants experience as well as it could (Hektner & Csikszentmihalyi, 2002; Stone et al., 1991). Another advantage of diary methods is that they can be used to record experience quickly. If a diary is properly implemented, time between the experience and report can be minimized and thus reduce memory errors and biases (Bolger, Davis, & Rafaeli, 2003).

Diary methods of apprehending inner experience have weaknesses. Although diaries can be deployed quickly, they are also labor intensive on the part of the participant. Keeping a dairy several or many times a day over several days can be taxing and intrusive on normal day to day activities. Also, there is the possibility that knowing that you will be writing down your experience may cause you to avoid certain kinds of socially undesirable activities and/or be

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selective about what you record (Bolger, Davis, & Rafaeli, 2003). Furthermore, selective remembering occurs when narratives are produced from experiences, and the resulting diary entry may misrepresent the participants experience (Linden, 1993). Forgetting to use the diary has been mentioned above, and those who record their experiences after they have happened may distort or fabricate their experience (O'Conner et al., 2006, Green et al., 2009, Stone et al., 2002).

Think Aloud and Articulated Thoughts in Simulated Situations

Think Aloud (TA) techniques attempt to examine presently occurring cognitions by verbally describing them as they happen. During TA, participants are typically instructed to think aloud during some task, and their verbalizations are recorded for later analysis. The instructions vary in their format and may include additional instructions such as "don't plan what to say or speak after the thought, but rather let your thoughts speak" (Silviera, 1972), instructing participants to focus more on articulating their thoughts than the task (Dunker, 1926), or instructions that are meant to elicit specific kinds of mental content of interest, visual perceptions, or physical sensations (Ericsson & Simon, 1984).

Ericsson and Simon (1984) held that TA methods could reasonably be assumed to be objective and reliable in representing the inner experience of participants if they met two conditions. First, the verbalizations analyzed need to be elicited during the task of interest and not produced by undefined situations. That is, participants should be engaged in some purposeful activity and not simply sitting and observing themselves statically. Secondly, the closer the participant is able to keep his verbalizations to the contents of his short term memory (what is

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presently in experience) the better and the more useful the data generated will be. Ericsson and Simon maintained that although many different kinds of verbal reports could be obtained, the only verbal reports suitable for analysis are those obtained concurrently with the task performed or those retrospectively recalled from what was concurrent from a previously performed task (e.g., watching a video of oneself). Ericsson and Simon maintained that psychological states were unknowable by introspection, but verbal reports of lower level cognitive processes could be trusted. Second, to maintain objectivity, categorization criteria need to be agreed upon before the data is obtained. The recordings produced from TA methods are coded and analyzed in various ways, mostly driven by the research question.

A variant of the TA method is Articulated Thoughts in Simulated Situations (ATSS; Davison, Robins & Johnson, 1983). ATSS was conceived a way to study the cognitive-behavioral therapy (CBT) assumption that irrational preconceived notions about how the world works are responsible for psychopathology. The method requires that a participant listen to a prerecorded realistic situation (usually audio, but not necessarily), and imagine themselves as participating in the scenario presented. The recording is punctuated by periods of silence (5-8 times every 30 seconds) during which the participant freely verbalizes his thoughts, feelings, inner speech, etc. (Zanov & Davison, 2010). These verbalizations are recorded and later analyzed, similar to traditional TA methods, in a variety of ways depending on the research question.

Apart from irrational thoughts in the CBT model, ATSS has been used to study social anxiety (Bates et al., 1996), anger and aggression (Barbour et al., 1998; Eckhardt, 2007; Eckhardt & Crane, 2008), specific phobia (Möller et al., 1998), and eating disorders (Clyne &

Blampied, 2004). ATSS has also been used as a measure of therapeutic change in a clinical setting (e.g., Davison et al., 1991; Szentagotai et al., 2008; Clyne & Blampied, 2004).

TA and ATSS have the advantage of being easy to administer, relatively quick, and for the most part require no special skill on the part of the investigators. Additionally it is easy to elicit descriptions of inner experience in a variety of contexts. Both methods can customize specific research questions easily and can be adapted to a variety of tasks and simulations. Also when compared to other methods, the focus of TA and ATSS on immediately occurring experience arguably lessens the chance that a participant may give a reaction to their inner experience, rather than the experience itself (Davison, Navarre, & Vogel, 1995). This may minimize recall errors as well (Ericsson & Simon, 1984). In the case of ATSS, situations which may be difficult or unethical to bring into the laboratory can be investigated in imagination with relative ease.

Using TA and ATSS to investigate inner experience has disadvantages. The process of concurrently voicing ones inner experience has been criticized as being an inherently unnatural process: data gleaned from such a method would lack ecological validity and experience would likely be disturbed by the process of verbalization (Klinger 1975). Reports generated from the process may also be influenced by the presence of the experimenter or the desire to present oneself in a positive manner (Genest & Turk 1981). Another limitation is that TA and ATSS assume that thoughts happen linearly, one after the other (Davison, Navarre, & Vogel, 1995). This presumption excludes the possibility of simultaneously occurring thoughts; there is evidence from other more naturalistic methodologies that multiple experience is common in some individuals (Hurlburt, 2011). Additionally, participants may limit their responses to what they think may be relevant to the circumstances of the experiment, or report only experiences

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that conform to preexisting presuppositions about what "should" be in their experience and would likely misrepresent the content of the participant's actual experience (Hurlburt & Heavey, 2003).

Experience Sampling Method and Momentary Ecological Assessment

One response to the various problems of diary methods, TA, and ATSS in the apprehension of inner experience was the development of methods that sample specific moments in natural environments. One such method is the Experience Sampling Method (ESM; Csikszentmihalyi, Larson & Prescott, 1977). ESM seeks to apprehend inner experience, behaviors, and environmental factors in a natural setting (Hormuth, 1986; Csikszentmihalyi & Larson, 1987).

Procedurally, researchers using ESM provide their participants with a small portable electronic device (programmable wristwatch, Palm Pilot, etc.) that delivers quasi random signals (usually a beep or a vibration) on occasions throughout the day, and a booklet of self-report questionnaires. The participants take the sampling device into their natural environment and when signaled fill out a questionnaire called an Experience Sampling Form (ESF). The ESF typically includes Likert-type scales to measure aspects of thinking, the intensity of various emotions, and so on, as well as open ended questions such as "As you were beeped what was the main thing you were doing?" The questions on the ESF vary according to the researcher's interest. ESF questionnaires typically take about two minutes to fill out. It is usual to collect information over the course of a week (Csikszentmihalyi & Larson, 1987).

Like diary methods, ESM has been implemented using paper and pencil as well as with electronic storage devices. Whereas the use of paper and pencil methods is cheap and easy, they

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have disadvantages. For example, when using paper and pencil the investigator does not have the ability to monitor the interval between the signal and the time when the participant fills out the ESF. Additionally, ESF forms can be bulky and inconvenient to carry along with the signaling device and thus may negatively affect compliance.

Electronic devices such as palmtop computers can reduce these concerns. The same equipment that delivers the signal can also be used to record the responses of the participants, thus eliminating the need to carry paper forms. Compliance with the method can also be tracked with the same device. Studies have indicated that the use of electronic devices in the method increases the probability of a timely response to the signal (Barrett & Barrett, 2001). However, the cost as well as the specialized nature of the programs required to track usage, deliver the signal, and record responses may limit their availability (Stone, Kessler, & Haythornthwaite, 1991). ESM signaling and recording technology has also been adapted for use with a smartphones (Randall & Rickard, 2013).

ESM is aimed at apprehending the inner experience of participants while taking into account situational factors that occur in everyday life. Csikszentmihalyi and Larson describe the purpose of ESM as making "the variations of daily experience, long outside the domain of objectivity, available for analysis, replication, and falsifiability, thus opening up a whole range of phenomena to systematic observation" (Csikszentmihalyi & Larson, 1987). ESM has been used to study the inner experience of adolescents (Csikszentmihalyi & Larson, 1984; Yip & Douglass, 2013), emotional reactions to music (Juslin et al., 2008), those suffering from schizophrenia (Delespaul & deVries, 1987), paranoid delusions (Udachina et al., 2014) dissociative identity disorder (Loewenstein, Hamilton, & Alagna, 1987), pain in cancer (Hedricks & Neville-Jan,

1995), people with bulimia (Johnson & Larson, 1982), body image concerns (Fuller-Tyszkiewicz et al., 2013), and risky behavior in young women (Farnworth, 1995).

Ecological Momentary Assessment (EMA) is similar to ESM in its use of signals delivered in a similar fashion to ESM but differs in that it often requires the participant to record a physiological measure (e.g., blood pressure) along with (perhaps) a self-report measure. Also, EMA typically employs a non-random signal schedule (unlike ESM, which is typically quasi random) to focus on a time period of interest to investigators. Signals are typically delivered several times over the course of a day, sometimes over the course of several weeks (Shiffman, 2000).

EMA's inclusion of physiological measures has made it attractive to researchers interested in medical topics. It has been used to study chronic pain (Bruehl et al., 2012), bariatric surgery patients (Bond et al., 2013), migraine patients (Houtveen & Sorbi, 2013), tension headaches (Kikuchi et al., 2011), insomnia (Miller et al., 2013) and habits of diet and exercise (Spook et al., 2013). It has also been applied the research of substance abuse and dependence (Lanza, Piper, & Shiffman, 2014; Buckner, Zvolensky, & Ecker, 2013; Marhe et al., 2013).

ESM and EMA have strengths. They are flexible enough to be used for either individual case studies or to draw generalizations about larger groups of people (Csikszentmihalyi & Larson, 1987). Additionally they are relatively simple for the participants using them and do not require extensive training. They are also ecologically valid, the data being collected in the participant's natural environment or actual situation of interest rather than a laboratory (Stone, Shiffman, & DeVries, 1999). When non-sampling-based-study participants are asked to summarize experiences over an interval of time, research suggests that more recent experiences

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influence recall to a greater extent than do experiences that are more distant (Schwarz &
Sudman, 1994). ESM and EMA avoid this bias by requiring reports immediately after the
signals, and also avoid the problem of decay of memory by minimizing the interval between the
event and the participant's reports.

These methods have limitations. Because they both use a self-report questionnaire, they
are subject to biased or purposefully inaccurate reporting. Participants may be tempted to
misreport information that is embarrassing, sensitive, or that differs from preconceived notions
of what the participant expects in his experience. Also, the characteristics of inner experience are
not discussed very often in everyday speech, and participants may have a difficult time
expressing what was in their experience. Without the guidance of a researcher, an inexperienced
participant may simply not have the words to describe what was in experience (Hurlburt &
Schwitzgebel, 2007). Also, the data collection is not able to be monitored (unless electronic
recording devices are used), and adherence to the established protocol cannot be assured,
(Hormuth, 1992).

There are also concerns about the ESF questionnaire that is administered in the ESM
method. Questionnaire methods by virtue of their fixed nature assume that the participant's
experience can be circumscribed within the bounds of the questionnaire. If the participant were
to have an experience that fell outside of what the questionnaire inquired about, the investigator
would not have a way to know about it and therefore would not receive a complete picture of
experience. This may result in participants selecting responses that are "close enough" but do not
describe experience accurately (Klinger & Kroll-Mensing, 1995). Although some of the
questions in the ESF are open ended, there is no way to know if the participant understood them

or was able to express what was in his experience. Researchers also do not typically have a way to ask a follow up question if the participant's response was unclear.

There are limitations to EMA as well. First, as opposed to ESM's questionnaires, EMA frequently requires participants to learn, self-administer, and record physiological measures (Shiffman & Stone 1998). This may preclude certain kinds of people from participating, creating a selection bias in the pool of participants (Stone et al., 1999). Additionally, it is still an open question the degree to which monitoring symptoms can interfere with the presentation of them. For example, asking chronically ill patients about their pain might alter their experience of pain (Stone, Shiffman, & DeVries, 1999). Several studies have examined reactivity in EMA (Hufford et al., 2002; Cruise et al., 1996; Heron & Smyth, 2013) but researchers have not yet reached a consensus to what degree, if any, reactivity may affect EMA data.

Descriptive Experience Sampling

Descriptive Experience Sampling (DES; Hurlburt, 1990) is another method of apprehending inner experience. Similar to ESM and EMA, DES uses a random beeper to cue the examination of particular moments of experience. Different from ESM and EMA, when the participant hears the beep, she writes notes about what was in her experience. These notes then serve to inform and constrain an open-beginninged and open-ended "expositional" interview held within 24 hours of sampling (or sooner if desired). After several iterations of these sampling day/ expositional interviews, investigators characterize the inner experience of the participants, noting the characteristics and qualities unique to each participant.

DES aims at descriptions of "pristine" experience, experience that is undisturbed by efforts to observe it (Hurlburt, 2011). DES is very careful to acknowledge the limitations

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inherent in self-report of experience and attempts to compensate for the various biases and environmental factors that might interfere with the high fidelity apprehension of pristine experience. These biases and factors may occur in the participants as well as investigators (Hurlburt, 2011). Hurlburt has developed many technical aspects that thoughtfully and carefully compensate for the weaknesses of other self-report methods with the intention of producing high fidelity and detailed descriptions of moments of experience. Whether those aspects are adequate must be examined in each situation.

The DES method collects ecologically valid data by instructing the participants to use the beeper in their own natural environments while engaging in their everyday activities. The beep is delivered in such a way as to be unambiguous to the participant. (That is, DES does not use stimuli such as vibrating pagers or phone calls can be mistaken for things other than "sample now!" beep and thus disturb experience before the cue has been completely recognized.) The beeper uses an earphone so that its delivery cannot be confused with ambient sounds, and the onset of the beep itself is abrupt so that the particular moment is unambiguously identified (Hurlburt & Schwitzgebel, 2007). When the beep randomly sounds, participants attempt to apprehend the ongoing experience and then write notes about it in a small notebook. After the participant collects about six beeps, he meets with the investigators within 24 hours for an expositional interview (Hurlburt, 2011). The interview asks about the beeped moments of experience and is guided by a set of principles that are used to keep the description as "faithful" to experience as possible (Hurlburt, 2011). This process is iterated over typically four or five days. These iterations are not mere repetitions; that is the participant is not expected to have proficiency in the method on the first sampling day. Instead, the expositional interview after the first sampling day trains the participant to be more skillful on the second day; the second

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expositional interview trains the participant to be more skillful on the third day, and so on. Because DES aims to provide detailed descriptions of experience, it has been used to explore the experience of various populations including individuals with schizophrenia (Hurlburt, 1990), depression (Hurlburt, 1993), anxiety (Hebert & Hurlburt, 1993), and Asperger's syndrome (Hurlburt, Happé, & Frith, 1994), and bulimia (Jones-Forrester, 2006). Aside from clinical populations, DES has been used to investigate the inner experience of groups of people who simply share a characteristic such as a high rate of speech (Hurlburt, Koch, & Heavey, 2002) and those who are left handed (Mizrachi, 2010, 2014) By using DES to study the experience of those who share traits, researchers can view commonalties that characterize a group, or are unique to the individual participant (Hurlburt & Akhter, 2006).

An example of how DES has been able to find similarities in the sampled experience of certain populations are the studies done with individuals with schizophrenia (Hurlburt, 1990; Hurlburt & Melancon, 1987). These individuals experienced a high frequency of inner visual experiences that were "goofed up" (tilted, obliterated, or inaccurate in detail). Also, although many of the participants displayed blunted affect, their moment-by-moment inner emotional experiences were clear or hyperclear. Another study found commonalties in individuals with Asperger's syndrome (Hurlburt, Happé, & Frith, 1994). These individuals' inner experience consisted mainly of visual images, and did not include feelings, inner speech, or bodily sensations. Additionally, these individuals had no experience more frequently than is typical in a non-Asperger population (Heavey & Hurlburt, 2008). DES has found higher levels of self-criticism in individuals with anxiety (Hebert & Hurlburt, 1993), elevated levels of unsymbolized thinking in depressed individuals (Hurlburt, 1993), and multiple concurrent experiences in women with bulimia nervosa (Jones-Forrester, 2006).

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Presuppositions about experience can influence the manner in which questions are asked and the manner in which descriptions are interpreted. Presuppositions are formidable hurdles in the apprehension of pristine experience (Hurlburt & Raymond, 2011). The DES method requires the "bracketing of presuppositions" that is, the putting out of play of personally held biases and theories that might influence an investigation. Bracketing presuppositions frees the investigator to more fully apprehend pristine experience. Bracketing presuppositions is a skill DES investigators must practice continually, and its focus on compensating for experimenter bias is a strength of the method.

One of the ways DES uses to bracket presuppositions is to attempt to be unbiased in the interviews. There are no set questions that are used, and the direction of the interview is determined largely by the participant's report of experience. Although the questions used in each interview vary, they are all variants or amplifications of "what, if anything, was in your experience at the moment of the beep?" This is an "open beginninged" (Hurlburt, 2011) question—it does not specify a priori the nature of the experience to be discussed, so that the interview takes place on what the participant describes, not on what the investigator is interested in. DES uses many techniques to help bracket presuppositions. For example, in asking questions DES investigators frequently present several equally plausible alternative responses, giving preference to none. This is a way to mitigate the inclination that some participants have to give the investigator what he is looking for, as well as keeping any preconceived notions that the investigator may hold from influencing the description of experience (Hurlburt, 2011).

The beginning stages of the interview process in DES serves a unique purpose. DES accepts that most participants are not skilled in apprehending their own experience, and the first few interviews serve to help the participant become familiar with the task and practice the skills

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required. Hurlburt (2009) describes DES as "iterative," meaning that repeated, successive approximation practice on the part of the participants is required. Focusing on exactly what moment is signaled by the beep, distinguishing external events from inner experience, and describing their experience is frequently difficult for participants and they require the guidance of the investigators. Misunderstandings of the task are also common, as well as misunderstandings of what constitutes experience (Hurlburt, 2011). The first several (typically one or two days) of the sampling/interview process are essential for learning the task, and the quality of the descriptions typically steadily increase as the sampling days progress. In practice this means that the first few days of reports of experience may not be trustworthy. However, because of the iterative process of DES, early mischaracterizations of experience can be replaced by later, more trustworthy, descriptions. This recognition of the participant's learning curve of apprehending experience and the steps taken to compensate are a major component of DES.

DES has the advantage of being applicable to most activities in which an investigator might be interested. Its openness to whatever may be in experience (not simply what might be expected in experience) is a distinct advantage that it has over questionnaire methods. Whereas questionnaires produce patterns of responses to specific questions, DES produces detailed descriptions of individual moments of experience and their salient characteristics. DES researchers do not make inferences about experience based on response to an a priori question; they refine a series of questions led by the unfolding description of the experience. For each sampled moment, investigators typically write a short paragraph describing the experience. After a course of several sampling days, this series of carefully described individual experiences are examined for salient characteristics, which may be recurrently appearing content but may also be a feature of a single moment's experience if it is deemed that that moment is understood in high

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fidelity. On the basis of that examination, a characterization of the experience of a particular participant is typically written.

Although DES takes pains to be open to all kinds of experience, studies utilizing the method frequently discover five phenomena (inner speaking, inner seeing, unsymbolized thinking, feelings, and sensory awareness; Heavey & Hurlburt, 2008) that have become known as the Five Frequent Phenomena (5FP; Kühn et al., 2014). These phenomena are broad classifications that describe frequently encountered inner experiences. Inner seeing can be defined as seeing something in imagination that is not actually present. Unsymbolized thinking is the experience of thinking a particular, definite thought without the awareness of that thought's being conveyed in words, images, or any other symbols. Feelings are affective experiences, such as sadness, happiness, humor, anxiety, joy, fear, nervousness, anger, embarrassment etc. Sensory awareness is the experience of paying attention to a particular sensory aspect of the environment such as color, smell, or texture (Heavey & Hurlburt, 2008). Inner speaking has been defined above.

 It should be emphasized that inner experience often (perhaps usually) does not fit well into one of these categories, and individual experiences may fit into several of these categories simultaneously, or fit into none of them at all.

Although DES maintains ecological validity by collecting samples in a naturalistic environment, there are concerns about the validity of the descriptions of experience. How, for example, might an investigator know if the description given by a participant actually describes an experience? There is evidence that descriptions of experience should not be implicitly trusted (Nisbett & Wilson, 1977). DES aims at a "co-investigator" relationship with the participant

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(Hurlburt, 2011) wherein the investigator and the participant work together on the descriptions, including working together to understand the fidelity of the descriptions. This attitude of co-investigator with the investigator also mitigates the tendency that participants may have toward positive self-presentation (Genest & Turk, 1981). Participants receive explicit instructions that they might decline to describe experience that may be embarrassing or personal (Hurlburt, 2011). DES aims at describing pristine experience in high fidelity, but acknowledges the limitations of the method. By being willing to accept that some experiences may not be accessible, investigators seek to raise the fidelity of the descriptions that they do collect. Becoming willing to accept "I don't know" as a valued answer to a question about experience is an integral part of the method. Additionally, participants may selectively remember and misrepresent their inner experience when asked to describe it over extended spans of time (Linden, 1993). DES avoids this pitfall by its exclusive focus on "the moment of the beep."

But how do investigators know when they should be mistrustful of a description on experience? One important thing that interviewers look for are instances of "subjunctification," that is, any words or body language that suggests that the participant may not be describing the beeped experience. Subjunctification is so named because participants often use verbs in the "subjunctive" mood (e.g., I would think...) when they are not describing experience directly. Statements such as these indicate that what is being described is the result of a presupposition or plausibility, not necessarily a description of an observed experience. Subjunctification can also include reference to assumed past experience ("I do *this* when *that* happens"), statements of universality ("this *always* happens"), and statement of causality (non-experientially present explanations such as "I experienced that *because…*"). Also included as subjunctification are behaviors such as appearing uncomfortable or unsure, long pauses, and checking for the approval

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of the investigators. Subjunctification can be a sign that the participant lacks faith in his description of experience and is seeking to qualify his uncertainty. Conversely, when participants speak confidently and with clarity, this can be a sign that they are speaking directly about experience. The presence of subjunctifiers in itself does not preclude a faithful description, as their presence may be due to other legitimate reasons (e.g., embarrassment, unfamiliarity with the task, difficulty articulating experience or individual personality). Investigators should, however note their presence and use the information to help distinguish trustworthy accounts of experience from untrustworthy ones (Hurlburt, 2011).

The many steps that DES takes to compensate for the various pitfalls of self-report are designed to increase the chances that a faithful description of experience will be produced. However, one of the weaknesses of DES is that it is difficult on the part of investigators who are new to the method to implement effectively all of the principles that lead to faithful apprehension of experience. To become proficient in DES requires a significant amount of time and practice. An additional weakness is that there does not presently exist a way to quantify the skill of an interviewer or the success of any one interview. Interviews are always recorded for later review, but quality control is still a concern.

Another weakness of DES is the significant time it requires for both the participants and the investigators. On each sampling day, the participant must wear the beeper for several hours and participate in an interview that typically lasts an hour. Multiplied by four to eight sampling/interview days, this can become tiresome or intrusive for the participants and may lead to attrition. Additionally, the labor intensive nature of DES restricts the number of participants who can be included in any one study due to reasons of practicality.

Notwithstanding these limitations, DES was well suited to the needs of the study, which sought to explore the inner experience of those rating themselves high on inner speech and those rating themselves low on inner speech. Its ecological validity and focus on efforts to mitigate both researcher and participant bias provided the possibility that its descriptions of inner experience were as faithful as possible. Furthermore, its open format potentially allowed aspects of experience that may have been missed with other methodologies to be apprehended.

CHAPTER 3

METHOD

Overview

The present study was composed of two phases: the screening phase and the sampling

phase. The study is part of a larger study that will not be described here, including a third phase

which took place after the two phases of the study described here had concluded.

Undergraduate volunteers ($N = 260$) taking introductory psychology courses at the

University of Nevada, Las Vegas completed a screening questionnaire that asked them to rate

their self-talk, a general inner experience questionnaire designed for this study, a measure of

psychopathology, and a short demographic form. Those scoring in the upper and lower quartiles

of the self-talk screening questionnaire were invited to the sampling phase.

Sixteen participants (6 from the lower quartile and 10 from the upper quartile as

identified in the screening phase) constitute the *DES group* and continued into the sampling

phase. Their inner experience was studied using the DES method.

Instruments

The Self Talk Scale (STS; Brinthaupt, Hein, & Kramer, 2009) was used as the screening

questionnaire in this study. The STS is a 16-item questionnaire that uses 5-point Likert scales

(from *never* to *always*) to ask about the frequency of self-talk / inner speech behaviors in various

situations. It thus produces a total score between 16 and 80. Brinthaupt, Hein, and Kramer (2009)

showed that the STS has good test-retest reliability ($r(99) = .66$, $p < .001$), and that those

identified as frequent self-talkers using the STS have been shown to have significantly higher

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STS scores ($t = 2.69$, $df = 44$, $p < .01$) on a measure of obsessive compulsive tendencies (Padua Inventory of obsessive–compulsive tendencies; Sanavio, 1988) than did those identified as infrequent self-talkers. Obsessive compulsive tendencies are thought to involve self-talk. Similarly, those identified as frequent self-talkers using the STS have been shown to have significantly higher scores ($t = 2.16$, $df = 44$, $P < .05$) on a measure of enjoyment of effortful cognitive activity (Need for Cognition Scale; Cacioppo, Petty, & Kao, 1984) than those identified as infrequent self-talkers using the questionnaire. Effortful cognitive activity are also thought to involve self-talk (Brinthaupt, Hein, & Kramer, 2009).

The Nevada Inner Experience Questionnaire (NIEQ) is a 20-item questionnaire designed for this series of studies as a way to compare as directly as possible inner experience as apprehended by DES to inner experience as reported by questionnaire. The NIEQ asks respondents to rate the frequencies of the 5FP in their own inner experience and in the experience of people in general. Responses are recorded on 10-point visual-analog scales between *Never* and *Always* or between *None* and *All*. The first ten items ask about the participant's own experience; the second ten ask about the participant's view of people in general. The present study uses only the first ten. Those ten items include two items for each of the 5FP Ratings on each of these pairs of items were averaged together to produce a score which can be considered an estimate of the percentage of time an individual spends engaged in each category of experience. The NIEQ was shown by confirmatory factor analysis to have five factors corresponding to those five pairs (Moynihan, in preparation).

The Symptom Checklist-90-Revised (SCL-90-R; Derogatis, 1994) is a 90-item self-report questionnaire that measures an individual's psychological challenges. The SCL-90-R uses five-point Likert scales to rate the frequency of a symptom's occurrence. It has subscales measuring

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somatization, obsessive-compulsive traits, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism. The SCL-90 shows high concurrent validity with other instruments. Weissman et al. (1977) found correlations with the Center for Epidemiological Studies Depression scale (CES-D) ranging from .72 to .84 across various populations. The SCL-90 also displays convergent validity with the MMPI, with correlations between related subscales ranging from .40 to .75 (Derogatis, Rickels, & Rock, 1976). Derogatis and Cleary (1977), using factor analysis, found high construct validity for the subscales of the SCl-90. Horowitz et al., (1988) found good test-retest reliability with correlations between administrations given 10 weeks apart ranging from .68 to .83 across the different subscales.

A demographic questionnaire, designed for this study, asked participants to provide their name, preferred phone number, age, race/ethnicity, sex, marital status, education level, and employment.

Apparatus

Those selected to be in the DES group used a random-interval device (beeper) developed by Hurlburt (Hurlburt & Heavey, 2002). The beeper is pocket sized (3 in by 4 in) rectangular device that has an adjustable volume. At randomly selected intervals (mean 30 min; minimum a few seconds; maximum one hour), the beeper delivers a 700Hz tone via an earphone.

Those sampled using DES also received a small spiral bound notebook for jotting notes about their inner experience.

Screening phase

Participants

This study involved two groups of participants. The "screened group" consists of 260 undergraduate students from the University of Nevada Las Vegas psychology subject pool participated in the screening phase of the study. The "DES group," a subset of the screened group, consists of 16 screened-group participants, 6 of whom scored in the top quartile and 10 who scored in the bottom quartile of the STS and who agreed to participate in the sampling phase.

To determine quartile cutoffs, we began with 60 and 45, cutoffs derived from Brinthaupt, Hein, and Kramer's (2009) validity study of the STS. Half way through data collection we discovered that our sample had a somewhat higher mean and standard deviation than did Brinthaupt et al., so we revised the cutoffs to quartiles based on our first 112 screen participants, using the upper quartile STS cutoff to be 66 and the lower quartile cutoff to be 52. Investigators were kept blind to group status. This study aimed to have nine participants in the High-STS group and nine in the Low-STS group. However, recruitment for those in the Low-STS group was difficult due to unknown factors, resulting in 10 High-STS group participants and 6 Low-STS group participants. Screened-group participants were given .5 research subject-pool participation credits; DES-group participants received 1 subject-pool credit and $10 for each hour of participation.

As part of a course requirement, undergraduate students were given the option to participate in the screening in exchange for .5 research participation credits. Participants had the option of declining further participation in the study at any time.

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Procedure

Participants met with the researchers in the Descriptive Experience Sampling Lab. After obtaining informed consent, participants were administered the STS, NIEQ, SCL-90-R and the demographic form. This took approximately twenty minutes; these 260 participants comprised the screened group.

The NIEQ was administered for comparative purposes as well as part of a validation study of this instrument.

A previous study has found that higher levels of inner speech are associated with lower levels of psychological distress (Heavey & Hurlburt, 2008), so the SCL-90-R was used to assess the relationships between inner speech and psychological distress.

Sampling Phase

Participants

Participants who scored below 52 or above 66 on the STS in the screening phase were invited to participate in the sampling phase.

Procedure

All participants and investigators were kept blind to group membership. These participants individually met with DES investigators approximately six times in the DES lab at the University of Nevada, Las Vegas (UNLV) campus. The first meeting introduced the participant to the procedure, completed the informed consent for this phase, familiarized them

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with the operation of the beeper, and answered any questions. The next four meetings (sampling phase meetings 2-5) were 1-hour long expositional interviews. During the expositional interviews the DES investigators interviewed the participant about the moments of experience that were indicated by the random beeper during the previous 24 hours. The last meeting (meeting 5) included a debriefing as well as an expositional interview. DES group participants received five dollars compensation per interview as well as one hour subject pool credit.

Meeting 1: Orientation

DES group participants met in the DES lab at the UNLV campus. The sampling phase of the study was completely described and they were asked to give informed consent; they were also informed that they may discontinue their participation in the study at any time. They were introduced to the task and familiarized with the operation of the beeper. DES group participants were also informed that the interview would be video recorded and that they may request that the tapes be destroyed at any time.

DES group participants were also given a pocket sized notebook to record the experiences indicated by the beeps. They were instructed to wear the beeper during everyday activities until they have responded to six beeps, which typically takes approximately three hours, during the 24-hours immediately before the next scheduled meeting. DES group participants were instructed that when the beep sounds, they should pay attention to the last undisturbed moment of experience before the onset of the beep, and to jot down notes about that experience in the notebook. The DES group participants were also told that they may decline to discuss any beeped experience.

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Meetings 2-5: Expositional Interviews and Debriefing

Within 24 hours of collecting the six beeped samples of experience, each DES group participant returned for an hour-long expositional interview to discuss the six collected moments of experience. The expositional interview was conducted by between two and five investigators, and has three purposes: to train the participant to become more skilled at sampling during the next sampling period, to allow the investigators to develop skills at apprehending the participant's talk, and to clarify the beeped experience of the participant. The interview depends on the particular characteristics of the participant's experience and the participant's particular ability or inability to apprehend those characteristics, and thus varied greatly from participant to participant. However, all questions asked are attempts to home in on high fidelity answers to the question "what was your experience at the moment of the beep?" Frequently, instead of describing the particular experience that was ongoing at the moment of the beep, participants will describe the circumstances leading up to the beep, content that came before the beep, content that came after the beep, or generalizations about their own or others' inner experience. All questions asked by the investigators are attempts to help the participant describe in higher and higher fidelity (as the participant becomes more and more skilled) the characteristics of the experience that was ongoing at the moment of the beep. Arriving at a faithful description of experience is thus a collaborative process between the participant and the investigators, each helping to guide the interview toward the experience that was ongoing at the moment of the beep. The DES method is thus an iterative process (Hurlburt, 2009, 2011) designed to help the participants gain skill at apprehending and describing their experience as the sampling procedure progresses. Because the participants are learning a new skill, the first day of the interviews is

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considered more of an opportunity for training rather than data collection, and data collected during the first day is discarded.

After the first sampling day and expositional interview, the DES group participant again wore the beeper in her natural environments and again collected six beeped experiences. Because of the training received during the first expositional interview, the participant is likely to be more skillful at apprehending experience. Then the participant returns for an expositional interview about those experiences. Because the participant is more skillful in apprehending experience, the next expositional interview was likely to produce higher fidelity descriptions as well as to provide yet another increment in skill at apprehending experience.

This natural-environment-sample and then expositional-interview procedure was repeated three more times, for a total of five natural-environment sampling periods and five expositional interviews.

The last of the five sampling days is part of a separate study investigating the inner experience of reading. DES group participants read two short stories on a computer monitor, and beeps were delivered with an earphone using the computer rather than a beeper. The reading task was performed in whichever location was convenient for the participant, the story and beeps being delivered by a website.

Debriefing

At the conclusion of their participation (which may include a third phase of the study not described here), participants were encouraged to ask any questions they may have about the method or their participation. Questions were answered completely and forthrightly.

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Sampling Data

The basic sampling data from this study consists of moments of experience that are selected by the random beep. The participant and investigators then cooperatively characterized these experiences during the course of the expositional interview. Within a few hours after the interview, one investigator produced a detailed description of each beeped experience, aided by notes taken during the interview and perhaps returning to the video recording of the interview. Those descriptions were then circulated to the other investigators for editing, disagreement, difference in emphasis or connotation, and so on. Sometimes consensus was reached in those discussions. Sometimes the investigators returned to the videotape in an effort to clarify aspects of the experience; that videotape review sometimes resulted in consensus. Sometimes, however, consensus was not reached about some aspect of the experience. The written descriptions of the sampled experience that resulted from these discussions were left showing any disagreements or differences in connotation on the possibility that later samples might illuminate a characteristic of the earlier sample.

This procedure was repeated across four sampling days, producing between 15 and 18 descriptions per participant in the DES group (excluding the first day). When all sampling days were complete for any individual participant, the investigators who had been involved in any of the interviews with that participant met and discussed each of the sampled experiences, using memory, notes, and the written raw descriptions as aids to recollection. Here again, sometimes consensus was reached in those discussions; sometimes an agreement to disagree was reached; sometimes the investigators returned to the videotape in an effort to clarify aspects of the experience. Across this discussion, salient characteristics emerged and were discussed. Following this meeting, each investigator independently (blind to each other's descriptions)

wrote a brief description of the emergent features of the participant's experience. Then the brief descriptions were circulated and compared, and one description of the participant's experience was written. Here again, the process allowed for minority positions to be sketched and kept in play for the remainder of the study. This procedure was repeated for all 16 DES group participants.

Classification of sampled experiences

After each *DES group* participant's inner experiences had been sampled, those experiences were coded as to whether any (or several) of the five frequently occurring phenomena (5FP) were present. Similar to the procedure when the experiences were first described, the researchers independently and blind to each other rated and classified each experience (the 5FP as well as other experiences). The researchers then met to discuss and compare their ratings. Where there was disagreement in the classification of an experience, the experience was discussed until either a consensus was reached or the issue could not be resolved, in which case the 5FP category was coded as .5.

Identifying the 5FP in experience is a complex process. With some experiences the 5FP classification is readily apparent. This example is the first sampled moment of experience from "Pamela's" fourth sampling day:

Pamela 4.1: At the moment of the beep, Pamela was innerly saying "diatom" in her own voice with no inflection. She had been repeating the word "diatom" over and over in her head, and the beep caught her on one of the repetitions.

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This is a clear example of inner speaking, and was coded as such.

Other experiences are less clear. For example:

> Georgia 4.5: Georgia was brushing her teeth. At the moment of the beep she was thinking something like "you've got to get up early to take Jaime in to the airport in the morning." This may have been innerly spoken in her own voice but without any words present. We were unable to determine how this idea was present, though there was a sense that innerly speaking may have been involved even though there were not specific words. It is also possible (or even likely) that this was an example of unsymbolized thinking in a person who had not yet accepted the possibility of that phenomenon.

In this example, the participant and researchers were not able to distinguish confidently whether the experience was inner speaking or unsymbolized thinking. There were aspects of the experience that suggested inner speaking, so, we coded the experience as ".5" of an occurrence of inner speaking and .5 unsymbolized thinking.

Some moments of experience contain multiple categories of the 5FP. For example:

> Harrison 4.2: Harrison felt pain in the tip of his tongue where he had just bit it. He described the pain as 7 out of 10 in terms of painfulness, and it was occupying 80% of his experience. The other 20% of his experience was saying to himself "Who bites their tongue?" in his own silent voice, in an exasperated tone. This inner speaking was of normal speed, was louder than his normal inner speaking volume, and just a little softer than his normal speaking aloud voice.

This experience was coded as both sensory awareness and inner speaking.

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Additionally, many participants had recurring themes or favored a certain kinds of experience which did not fit any of the 5FP categories. Those idiographic categories were described by the investigators but are not included in this study.

CHAPTER 4

RESULTS

This study explored the relationships between self-reported inner experience as apprehended by the Self Talk Scale (STS) and the Nevada Inner Experience Questionnaire (NIEQ) and pristine inner experience as apprehended by Descriptive Experience Sampling (DES). Additionally the study explored the relationships between a measure of psychological distress (SCL-90-R) and inner experience.

Table 1 shows the descriptive statistics for questionnaires in both the screened group ($N = 260$) and DES groups (upper quartile on the STS, $N = 10$; and lower quartile on the STS, ($N = 6$) used in the study. We begin by examining the STS column. The STS can be taken as a self-report measure of the frequency of inner speech. Preliminarily we note that the mean STS score for all participants in our study (shown in the "All" row at the top left of Table 1) was 59.01, significantly higher ($t = 5.56$, $df = 465$, $p < .001$) than the mean of 53.52 reported by Brinthaupt et al. (2009) in their STS validation study (shown for comparison in the bottom row of Table 1).

We used the STS upper and lower quartiles to screen participants. Table 1 shows that the means of those quartiles for all participants (71.35 and 45.51) were significantly different from each other (as would be expected: $t = 27.98$, $df = 117$, $p<.001$).

Our High-STS group DES participants were a sample from the screened upper quartile; the mean of the High-STS group DES participants (71.40) was very similar to the mean of the upper quartile of all participants (71.35; $t = .034$, $df = 68$, $p = .97$). The Low-STS Group DES participants' mean STS score (42.00) was very similar to the mean of the lower quartile of all

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Table 1: Questionnaire Descriptive statistics: Means and (Standard Deviations)

				STS	SCL-90-R	NIEQ percentages				
			N	total score *M(SD)*	total score *M(SD)*	IS[a] *M(SD)*	IMG *M(SD)*	UNS *M(SD)*	FEEL *M(SD)*	SENS *M(SD)*
Participants	Screened group	All	260	59.01 (9.87)	84.01 (52.50)	68.32 (17.14)	66.08 (20.71)	37.77 (23.36)	74.31 (17.87)	61.91 (17.52)
		Upper quartile	60	71.35 (3.90)	93.92 (54.46)	77.37 (13.29)	73.59 (22.68)	40.24 (24.51)	82.10 (16.08)	65.96 (18.30)
		Lower quartile	59	45.51 (5.98)	65.17 (38.59)	55.49 (18.66)	60.17 (21.86)	39.89 (22.85)	65.58 (18.40)	62.00 (16.00)
		t (*df* = 117) *p* *d*		27.98 .000 5.12	3.32 .001 0.61	7.38 .000 1.35	3.28 .001 0.60	0.08 .936 0.01	5.22 .000 0.96	1.26 .211 0.23
	Des group	All	16	60.38 (15.59)	73.19 (46.33)	66.63 (25.60)	69.03 (27.25)	38.75 (25.32)	79.06 (19.96)	68.55 (18.70)
		High-STS	10	71.40 (4.97)	86.90 (48.98)	81.33 (9.65)	72.03 (28.38)	35.45 (27.16)	87.15 (13.24)	70.63 (18.89)
		Low-STS	6	42.00 (6.00)	50.33 (33.42)	42.13 (25.42)	64.04 (27.00)	44.25 (23.19)	65.58 (23.04)	65.08 (19.59)
		t (*df* = 14) *p* *d*		10.62 .000 5.34	1.61 .130 0.87	4.45 .001 2.04	0.55 .588 0.29	-0.66 .520 -0.35	2.40 .031 1.15	0.56 .584 0.29
Brinthaupt et al. (2009)			207	53.52 (11.55)	-	-	-	-	-	-

[a]IS= Inner Speaking, IMG=Inner Seeing, UNS= Unsymbolized Thinking, FEEL=Feelings, SENS=Sensory Awareness

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participants (45.51; $t = 1.37$, $df = 63$, $p = .18$). Our aim was to obtain DES groups that were different from each other in self-reported inner speech, and we were successful in doing so: the High-STS group mean was 71.40 and the Low-STS group mean was 42.00 ($t = 10.62$, $df = 14$, $p<.001$). Altogether, these results suggest the High-STS and Low-STS DES groups were representative samples from the upper and the lower quartiles screened with the STS and were indeed very different from each other on questionnaire-reported inner speech.

Table 1 also shows analogous statistics for the SCL-90-R (a self-report measure of psychological distress). The SCL-90-R scores were significantly different between the upper and lower quartiles of the screening group (upper mean = 93.92, lower mean = 65.17, $t = 3.32$, $df = 117$, $p = .001$), with those in the upper quartile (higher self-reported inner speech) reporting more psychological distress. The DES High-STS group and Low-STS group differed in the same direction (High-STS group mean = 86.90, Low-STS group mean = 50.33), but this difference was not statistically significant ($t = 1.61$, $df = 14$, $p = 0.13$).

Finally, Table 1 shows the NIEQ (a self-report of the five most frequently occurring phenomenon in experience or *5FP*) means and standard deviations broken down the same way. We first look at the screened ($N = 260$) group. First and predictably, those scoring in the upper and lower quartile of the STS also had significant differences (upper mean = 77.37, lower mean = 55.49; $t = 7.38$, $df = 117$, $p = .000$) on the inner speaking items of the NIEQ (NIEQ-IS). However, the upper-STS-quartile group also had significantly higher scores on self-ratings of inner seeing (NIEQ-IMG; upper mean = 73.59, lower mean = 60.17, $t = 3.28$, $df = 117$, $p = .001$), and feelings (NIEQ-FEEL; upper mean = 82.10, lower mean = 65.58, $t = 5.22$, $df = 117$, $p< .001$). Sensory awareness (upper mean = 65.96, lower mean = 62.00) and Unsymbolized thinking

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(upper mean = 40.24, lower mean = 39.89) was not significantly different between the upper and lower STS quartile of the screened groups (NIEQ-SENS; $t = 1.26$, $df = 117$, $p = 0.211$, NIEQ-UNS; $t = 0.08$, $df = 117$, $p = .936$).

Considering next the NIEQ ratings for the DES group ($N = 16$), we see a similar trend as in the screened group: the High-STS group self-reported significantly more inner speaking than did the Low-STS group (NIEQ-IS ; High-STS group mean = 81.33, Low-STS group mean = 42.13, $t = 4.45$, $df = 14$, $p = .001$) as well as feeling (NIEQ-FEEL; High-STS group mean = 87.15, Low-STS group mean = 65.58, $t = 2.40$, $df = 14$, $p = .031$). However, unlike the screened group, there was not a difference in the amount of self-reported inner seeing (NIEQ-IMG; High-STS group mean = 72.03, Low-STS group mean = 64.04, $t = 0.55$, $df = 14$, $p = .588$). These results suggest that the screening questionnaire separated the participants into two groups with distinct retrospective ideas about their own experience as a whole (not simply inner speaking).

Table 2 elaborates the results that were summarized in the first row of Table 1, showing correlations in the screened group ($N = 260$) among the STS, SCL-90-R, and NIEQ scales. The primary focus of this study is inner speaking. There is a strong positive correlation (.52) between the STS and the NIEQ-IS (the inner speaking scale of the NIEQ). This relationship is also illustrated in Figure 1. That this correlation is less than 1.0 reflects sampling error as well as the imperfect overlap of these two questionnaires (the STS includes audible speech as well as inner speaking, whereas the NIEQ inquires only about inner speaking). Not shown in the table, the correlation between the STS and NIEQ-IS was also strong (.83) among the DES participants ($N=16$). This relationship is shown in Figure 2. Other strong correlations ($p < .01$) between the various questionnaires are marked by a double asterisk (**), but as the aim of this study is

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Table 2: Questionnaire correlations^a across all participants (screened group)

		STS	SCL-90-R	NIEQ			
		Total score	Total score	IS[b]	IMG	UNS	FEEL
SCL-90-R	Total score	0.24**					
NIEQ	IS[a]	0.52**	0.12				
	IMG	0.27**	0.27**	0.30**			
	UNS	0.01	0.06	-0.13	0.02		
	FEEL	0.36**	0.29**	0.21**	0.27**	0.05	
	SENS	0.13	0.23**	0.08	0.43**	.31**	0.35**

^a *df* = 258

^b IS= Inner Speaking, IMG=Inner Seeing, UNS= Unsymbolized Thinking, FEEL=Feelings, SENS=Sensory Awareness

** *p* < .01, not corrected

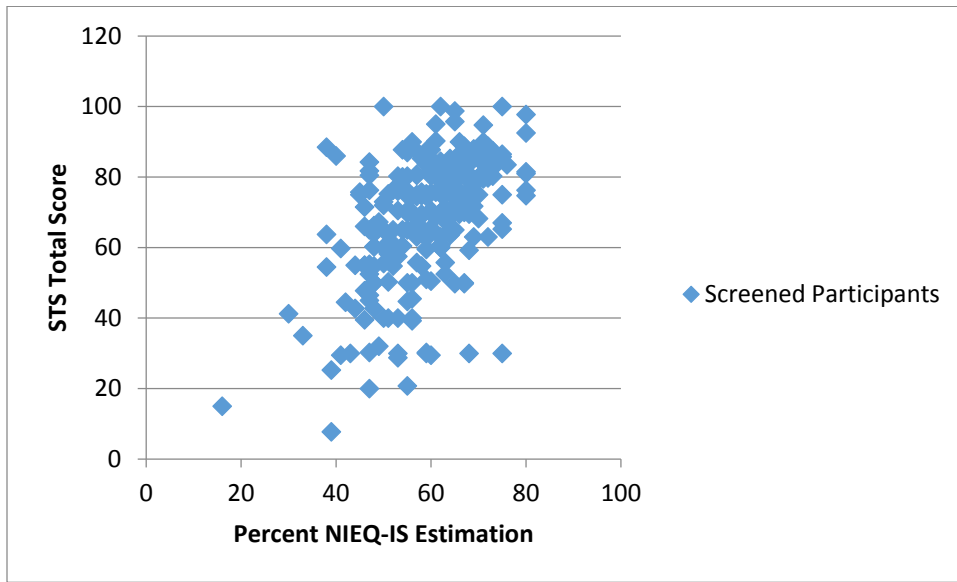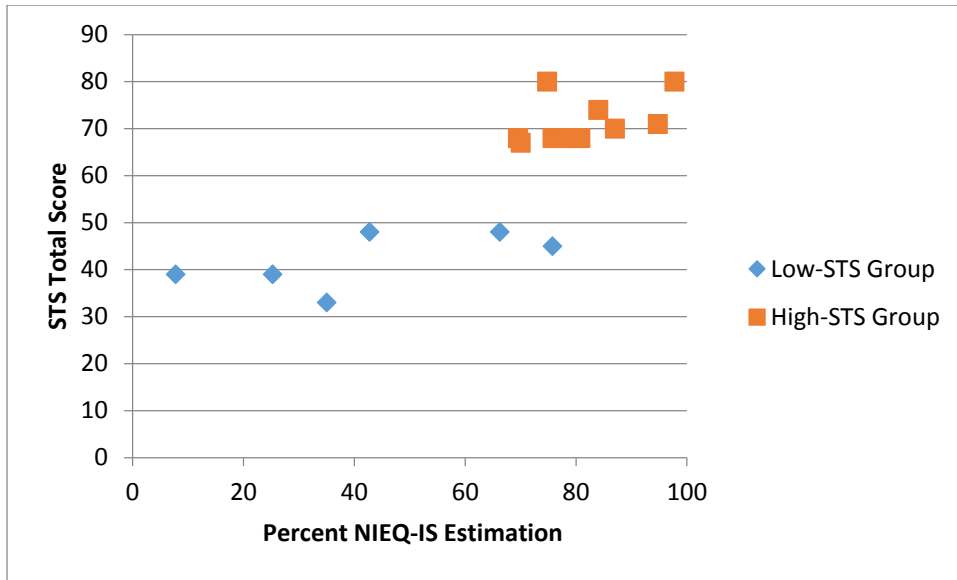*Figure 1: STS total score and NIEQ-IS across all participants (screened group)*

Figure 2: STS total score and NIEQ-IS across DES sampled participants (DES group)

exploratory, they should be taken as suggesting relationships and have not been corrected by procedures such as suggested by Bonferroni.

Table 3 presents the study's main results, from two perspectives. First, the middle panel of Table 3 presents the main DES sampling results–the DES 5FP percentages–for all our DES participants and for those in the High-STS group and Low-STS group. Here we are particularly interested in the Inner Speaking (IS) column of Table 3, where we see that inner speaking occurred in 14.99 percent of all our DES participants' samples. The High-STS group had a higher percentage of inner speaking in their experience than did the Low-STS group (High-STS group percentage = 17.81%, Low-STS group percentage = 10.30%); however, that difference was not statistically significant. The DES apprehended inner speaking for the High-STS and the Low-STS groups is shown in Figure 3 as a function of STS score and in Figure 4 as a function of NIEQ-IS score. The only statistically significant difference in the sampled experience of the High-STS group and Low-STS group was unsymbolized thinking, with the High-STS group having a significantly lower percentage (High-STS group percentage = 7.03%, Low-STS group percentage = 18.31%; $t = -2.26$, $df = 14$, $p = 0.040$) than did the Low-STS group. Second, Table 3 compares DES sampling to the retrospective questionnaire results, comparing the 5FP percentages as found by DES sampling to their retrospective ratings on the NIEQ questionnaire (repeated from Table 1 for comparison). There are very large differences between the percentages from the DES sampling and the corresponding NIEQ questionnaire results, with self-ratings being much larger for all categories of experience. For example, our High-STS group participants prior to DES sampling retrospectively characterized (on the NIEQ) their inner

Table 3: DES group 5FP percentages and NIEQ values for comparison

DES Group	N		DES 5FP percentages					NIEQ 5FP percentages				
	Particip.	Samp.	IS[a]	IMG	UNS	FEEL	SENS	IS	IMG	UNS	FEEL	SENS
All	16	270	14.99 (15.42)	20.11 (16.21)	11.26 (10.91)	17.51 (15.48)	31.86 (20.44)	66.63 (25.60)	69.03 (27.25)	38.75 (25.32)	79.06 (19.96)	68.55 (18.70)
High-STS	10	170	17.81 (18.37)	17.67 (15.90)	7.03 (5.38)	19.76 (18.13)	35.76 (22.64)	81.33 (9.65)	72.03 (28.38)	35.45 (27.16)	87.15 (13.24)	70.63 (18.89)
Low-STS	6	100	10.30 (7.98)	24.17 (17.37)	18.31 (14.48)	13.75 (10.02)	25.35 (15.79)	42.13 (25.42)	64.04 (27.00)	44.25 (23.19)	65.58 (23.04)	65.08 (19.59)
t (df =14) p d			0.94 .364 0.53	-0.77 .457 -0.39	-2.26 .040 -1.03	0.74 .471 0.41	0.99 .341 0.53	4.45 .001 2.04	0.55 .588 0.29	-0.66 .520 -0.35	2.40 .031 1.15	0.56 .584 0.29
Heavey & Hurlburt[c]	30		26.00	34.00	22.00	26.00	22.00					

[a] IS= Inner Speaking, IMG=Inner Seeing, UNS= Unsymbolized Thinking, FEEL=Feelings, SENS=Sensory Awareness

[b] Shaded cells repeated from Table 1

[c] Values from Heavey & Hurlburt (2008)

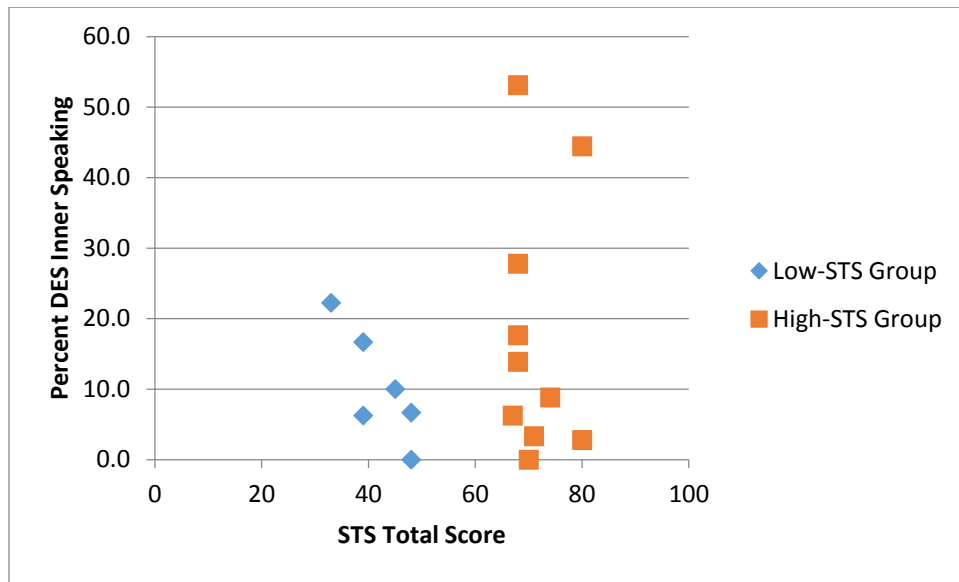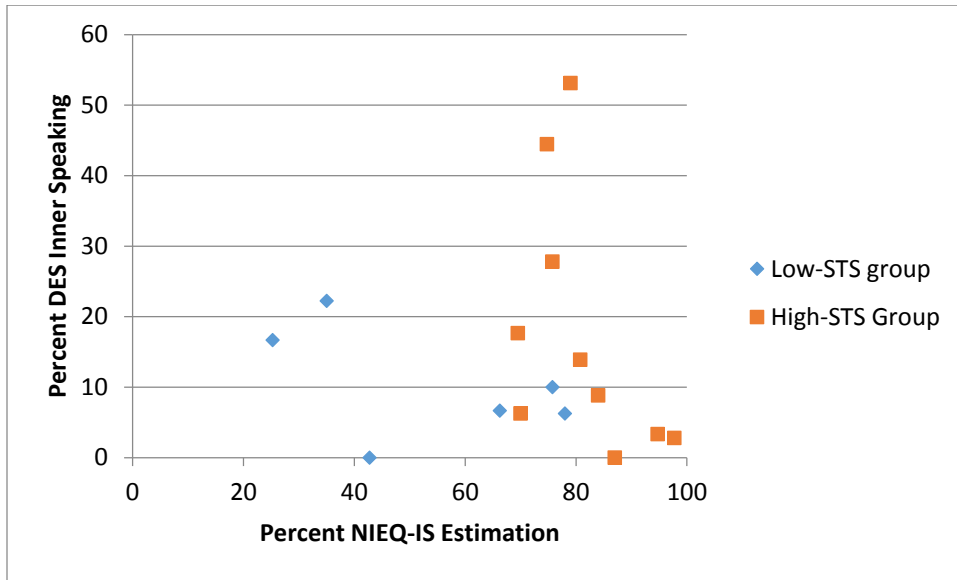*Figure 3: STS total score and DES inner speaking*

Figure 4: Percent NIEQ-IS and DES inner speaking

speaking as occurring on average 81.33 percent of the time, but their DES sampling percentage was 17.81 percent ($t = 11.22$, $df = 8$, $p < .0001$.) The Low-STS group retrospectively characterized their inner speaking experience as occurring 42.13 percent of the time, but their sampled experience was 10.30 percent ($t = 9.30$, $df = 4$, $p < .0001$). Even the smallest difference (between the Low-STS groups retrospective characterization of unsymbolized thinking and DES sampled unsymbolized thinking) was significant (18.31% for DES compared to 44.25% for the NIEQ; $t = -4.32$, $df = 4$, $p = .002$). These results very strongly suggest that questionnaire methods of studying experience may produce large overestimations.

Additionally, Table 3 (bottom row) shows that the 5FP characteristic percentages that we found were all lower than those found by Heavey & Hurlburt (2008) with the exception of sensory awareness. Of particular interest here, Heavey and Hurlburt found that inner speaking occurred 26 percent of samples, whereas we found only 14.99 percent.

Table 4 shows the correlations ($df = 14$) between the frequency of the 5FP characteristics as apprehended by DES sampling and the frequencies obtained from the retrospective questionnaires used in this study. We mark with an asterisk (*) those correlations that would be called significant ($p < .05$) in a hypothesis test of one correlation, using uncorrected (by Bonferroni procedures) significances because the aim of this study is exploratory rather than hypothesis testing. Thus these correlations should be viewed as suggesting relationships, not confirming them.

Table 4: Correlations[a] of 5FP characteristics as apprehended by DES with retrospective measures

		STS	NIEQ					SCL-90-R
		*T*otal score	IS[b]	IMG	UNS	FEEL	SENS	*T*otal score
DES	IS	**0.18**	0.03	-0.09	-0.31	-0.05	0.11	-0.10
	IMG	-0.09	**0.20**	**0.29**	**0.37**	0.15	**0.48**	**0.20**
	UNS	**-0.50**	**-0.66**	-0.06	-0.03	-0.19	-0.12	-0.13
	FEEL	0.06	0.14	**0.26**	0.19	-0.02	**0.28**	**0.64**
	SENS	0.12	0.05	**0.50**	**-0.27**	-0.08	-0.09	0.09

[a] *df* = 14

[b] IS= Inner Speaking, IMG=Inner Seeing, UNS= Unsymbolized Thinking, FEEL=Feelings, SENS=Sensory Awareness

* *p* < .05, not corrected

The DES sampling results are in the rows of Table 4; the questionnaire measures are in the columns. Of particular interest here is the first row, the correlations between inner speaking as apprehended by DES and characteristics retrospectively reported on the STS and the NIEQ-IS scales. These correlations would be expected to be moderately high if people know the characteristics of their own inner experience. However, Table 4 shows a low correlation ($r = .18$, $p = .53$) between inner speaking as apprehended by DES sampling and inner speaking as retrospectively reported on the STS. The parallel correlation between DES-apprehended inner speaking and the NIEQ-IS scale, which defines inner speaking the same way as does DES, was near zero ($r = .03$, $p = .91$). Continuing across the DES-IS row, we see that the only moderately large (but still not significant) correlation is the negative relationship between sampled inner speaking and unsymbolized thinking ($r = -.31$, $p = .26$).

An alternative way of viewing our particular interest is to focus on the NIEQ IS column, which reports the correlations between retrospectively reported inner speech and the sampling results. Those correlations are all very low except for the strong negative correlation with unsymbolized thinking: those who retrospectively hold themselves to be frequent inner speakers in fact have little unsymbolized thinking ($r = -.66$, $p = .004$).

We note in passing (not our central interest) that Table 4 shows a positive correlation between sensory awareness as apprehended by DES and retrospective rating of inner seeing on the NIEQ (NIEQ-IMG; $r = .50$, $p = .048$). Our participants' retrospective belief in frequent visual imagery was correlated with sampled visual imagery ($r = .29$, $p = .31$), but was more strongly correlated with sensory awareness.

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We also note in passing that this study found that higher levels of feelings found in DES

sampling were associated with higher overall levels of psychological distress as reported by the

SCL-90-R ($r = .64$, $p = .048$).

CHAPTER 5

DISCUSSION

The aim of this study was to compare retrospective self-reports of inner speaking (as apprehended by questionnaire) to the retrospective self-reports of inner speaking and to inner experience as apprehended by Descriptive Experience Sampling (DES). Undergraduate volunteers ($N = 260$) were administered three questionnaires: the Self Talk Scale (STS, a retrospective measure of self-talk and inner speaking), the Nevada Inner Experience Questionnaire (NIEQ, a retrospective measure of the five most frequent phenomena as apprehended by DES, including inner speaking), and the Symptom Checklist 90 Revised (SCL-90-R, a retrospective measure of overall psychological distress). Then a subset of these volunteers ($N = 16$) participated in DES to investigate their inner speaking with as much fidelity as possible.

First we ask whether the NIEQ, which was designed for this series of studies, is a valid measure of inner speaking. The study used two retrospective questionnaire measures of inner speaking: the two inner speaking items from the NIEQ and the full scale of the STS. We summed the two NIEQ inner speaking items to create the NIEQ-IS, the inner speaking scale of the NIEQ, and then investigated the relationship between the NIEQ-IS and the STS, finding a rather strong correlation ($r = .52$). This is evidence establishing, in the way often used with questionnaires, the concurrent *validity* of the NIEQ-IS as a measure of inner speaking. The correlation between the NIEQ-IS and STS is not higher as there is an imperfect match between the two questionnaires- the STS asks about all self-directed speech (audible and inaudible) , while the NIEQ-IS specifically excludes audible speech.

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However, the target of both the STS and the NIEQ-IS is an actual behavior--inner speaking, so the study could also address the *criterion validity* and *construct validity* of both instruments: to what extent do the STS and NIEQ-IS measure actual inner speaking and how true are conclusions based on these instruments? To explore this, the study divided the 260 participants into quartiles based on their scores on the STS and then selected ten participants from those scoring in the top quartile of the STS to comprise the *High-STS group* and six participants from those scoring in the lower quartile to comprise the *Low-STS group.* Then we sampled, using DES, all 16 participants' real world, naturally occurring experiences. These sampled experiences were categorized and the frequency of occurrence of the categories compared to the STS and NIEQ ratings of experience.

The NIEQ-IS is the result of asking respondents to estimate the percentage of time they spend engaged in inner speaking (other NIEQ items inquire about the time engaged in other aspects of inner experience). When comparing NIEQ-IS to DES-sampled experience, the NIEQ - IS grossly overestimated the frequency of DES-apprehended inner speaking. This gross overestimation occurred in both groups. On the NIEQ-IS, the High-STS group estimated inner speaking to occur in 81 percent of their experience, whereas DES showed that inner speaking was present in 16 percent of their experience (an overestimate by a factor of 5). The Low-STS group made lower NIEQ-IS retrospective estimates than did the High-STS group (42% compared to 81%), but these estimates still were substantial overestimations (42% on the NIEQ-IS compared to 10% from DES, an overestimate by a factor of 4). We thus conclude that the retrospective estimates of inner speaking made on the NIEQ are *not* accurate characterizations of experience.

The correlation between questionnaire measures of inner speaking (STS and NIEQ-IS) and inner speaking as apprehended by DES further explores the criterion validity of these questionnaires. The correlation between the NIEQ-IS and inner speaking as apprehended by DES is near zero all those who participated in DES ($r = 0.03$, $df = 14$); the correlation between the STS and inner speaking as apprehended by DES is also very small ($r = 0.18$, $df = 14$). Furthermore, these correlations were computed on participants who were selected from the upper and lower quartiles of the STS, a procedure that would be expected to inflate the correlations— even with this inflation, the observed correlations were close to zero. This suggests that these questionnaires may not be a valid measure of inner speaking, but may be measuring something else entirely. For example, there is a large and significant negative correlation between the NIEQ-IS and unsymbolized thinking as apprehended by DES ($r = -0.66$). The STS also had a negative correlation with unsymbolized thinking ($r = -0.50$) but it was not significant. Thus, participants' responses to questionnaire items about inner speaking were more strongly associated with lack of unsymbolized thinking than directly to inner speaking.

The High-STS group did not have a significantly different percentage of DES inner speaking than did the Low-STS group. The only significant difference between the sampled experiences of the two groups were lower unsymbolized thinking for the High-STS group. The STS, (which asks only about inner speaking) was a much better predictor of (lack of) unsymbolized thinking than of inner speaking itself. This suggests that the STS may not be measuring what its creators intended.

Taken together, these results suggest a low criterion validity for the STS and the NIEQ-IS as measures of inner speaking. These results were aimed primarily at inner speaking. However, because inner speaking is a relatively easy characteristic to identify and notice, and yet was

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retrospectively substantially mischaracterized, these results suggest that, in general, questionnaires that aim to study experience retrospectively might produce results that differ in a substantial way from actual experience. Because the STS actually is as good or better a measure of all the features of inner experience that we measured than of the self-talk for which it was designed, we think it reasonable to suppose, at least tentatively, that questionnaires in general may measure something unintended due to presuppositions about the nature of experience–participants are likely giving their impression of their experience, rather than a faithful representation (Hurlburt & Heavey, 2001). Participants are often not likely to be aware of their own inner experience (Nisbett & Wilson, 1977; Hurlburt, 2011), and a questionnaire that aims at inner experience (such as inner speaking) may simply be tapping into preconceptions. The consistent pattern of questionnaire overestimation of DES–discovered categories of experience for all of the 5FP may be due to the power of preconceptions. The STS and NIEQ-IS may not be measuring any single aspect of experience at all; rather they may be measuring preconceived notions of richness of personal experience (the High-STS group members rated themselves higher than did the Low-STS group on all experiences except unsymbolized thinking).

There are many reasons that experiential categories might be overestimated. Here are four: First, preexisting ideas of one's personal characteristics (especially those deemed positive) can strongly influence self-evaluations (Ehrlinger et al., 2008, Ehrlinger & Dunning, 2003, Crosby & Yarber, 2001). Second, neither the STS nor the NIEQ-IS specify a timeframe, asking respondents to generalize over an unspecified time period, a procedure that invites errors of memory. Third, it is possible that inner speaking comes to mind easily and the overestimations are the result of the availability heuristic (Tversky & Kahneman, 1973). Fourth, when the participant is asked about the characteristics of their experience, they casually ask themselves

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"what is in my experience now?" (that is, they engage in "armchair introspection"; Hurlburt & Schwitzgebel, 2011). Answering a self-imposed verbal question may result in inner speaking. These factors suggest that conclusions about inner speaking (and experience in general) based on questionnaires are unlikely to be correct, and imply low construct validity.

Throughout this paper, we have used DES as the criterion measure of experience. That use has limitations. As a tool to explore inner experience, DES mitigates many of the weaknesses inherent in questionnaire methods. DES takes pains to ensure that the investigators and participants share a vocabulary when speaking about experience, and its co-investigator relationship with the participants makes it more likely that these sorts of misunderstandings are detected and discussed. The focus on specific moments of experience greatly reduces the likelihood of participants' memory errors. DES actively searches for and brackets (holds aside, puts out of commission) preconceived notions of experience (from both the participant and investigator) increasing the likelihood that a description may be faithful to the experience, not simply an impression of or theory about oneself. Not assuming the participant has the perfect ability to apprehend his own experience and allowing him to practice through several iterations of the method additionally increases the ability of DES apprehend and study inner experience. Although it is not a perfect solution for these problems, DES makes faithful descriptions of experience more likely. However, taking such pains in no way guarantees that DES in general produces faithful descriptions, nor that our application of DES was adequate.

Although the small sample size ($N = 16$) of this study warrants caution in any interpretation, there were some differences in the relationship between inner experience and the SCL-90-R in our STS screened sample, and Heavey and Hurlburt's (2008) study which used a sample stratified by SCL-90-R Scores ($N = 30$). This study found a strong correlation between

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feelings and psychological distress ($r = .64$) whereas Heavey and Hurlburt found a much smaller (though still positive) correlation ($r = .18$). This study found almost no correlation ($r = -0.10$) between inner speaking and psychological distress whereas Heavey and Hurlburt found a relationship between inner speaking and psychological distress such that higher levels of inner speaking were associated with lower levels of psychological distress ($r = -.36$). Additional research is needed to draw any definitive conclusions in the relationship between inner speaking and psychological distress.

Questionnaires are used ubiquitously through most of the study of psychology and it is easy to understand their popularity: they are inexpensive, relatively quick, easy to administer in large numbers, and produce data that can be easily analyzed statistically. However this study suggests caution in using such instruments to infer the characteristics of inner experience. Although this study looked primarily at inner speaking, it seems probable that the inaccuracies and difficulties we found may have their counterparts in other kinds of experience. Future studies comparing other questionnaires that are aimed at apprehending experience would increase understanding of the relationship between retrospective ratings and actual experience.

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CURRICULUM VITAE
Jason M. Kelsey
Kelseyj3@unlv.edu (702) 354-4159

Education
B. A., Psychology, University of Nevada Las Vegas June 2010

Conference Presentations

Kelsey, J.M., & Copeland, D.E, (2010). *The effects of impulsivity on immediate and future adaptive memory scenarios*. Poster presented at the meeting of the Association for Psychological Science, Boston, MA.

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