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Mediating processes of two communication interventions for breast cancer patients

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Abstract

Objective—Test whether three mediating processes of Self-Determination Theory are involved in intervention effects on quality of life for breast cancer patients.

Methods—A randomized clinical trial recruited newly diagnosed breast cancer patients for 6 months of (1) Internet training and access, (2) access to an integrated eHealth system for breast cancer (CHESS), (3) a series of phone conversations with a Human Cancer Information Mentor, or (4) both (2) and (3).

Results—This paper reports results after the initial 6 weeks of intervention, at which point patients in the combined condition had higher quality of life scores than those in the other three conditions. All three Self-Determination Theory constructs (autonomy, competence, and relatedness) mediated that effect as hypothesized. In addition, the single-intervention groups were superior to the Internet-only group on relatedness, though perhaps this was too soon for that to carry through to quality of life as well.

Conclusions—The SDT constructs do mediate these interventions' effects.

Practice implications—Intervention design can profitably focus on enhancing autonomy, competence and relatedness.

Keywords

e-Health; Internet; Patient mentoring; Self-Determination Theory; Interactive cancer communication systems; Quality of life; Breast cancer

1. Introduction

Internet applications are currently the main focus of attention and expectation among communication media, and nowhere is this more true than in health communication [1,2]. We variously hope that the Internet will allow universal access in which time and money

Conflict of interest

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become irrelevant, that the public and especially patients will be well-informed about health and disease, that they will be empowered to appropriately share in medical decision making, that unnecessary anxieties will be relieved, and that healthy behaviors will be embraced and harmful ones eschewed. As a communication medium, many hope the Internet's tailoring, interactivity and multi-media potentials will make it far more powerful than other channels through greater and more focused attention, sense of presence, and enhanced efficacy.

However, there is far more speculation than solid evidence about whether these benefits occur. Realizing the hoped-for promise of this medium first of all calls for evidence that benefits actually occur. But even more importantly, neither the medium nor health issues are unitary things. Research that really moves us forward will have to illuminate just how particular interventions provide specific benefits to individuals or health care systems. Different health needs may well require very different communication solutions, and for some needs there may be no communication solution at all.

The research reported here focuses on serving the needs of women newly diagnosed with breast cancer, the most common cancer among women [3]. Despite reduced mortality due to earlier detection and treatment, both treatment and the simple fact of diagnosis expose women and their families to anxiety, uncertainty, fear of death, unfamiliar information and decisions, considerable pain and discomfort, and disruption of social relationships [4,5]. In other words, her quality of life will be negatively affected for a considerable period of time [6].

Helping a woman deal with the shocks of diagnosis and treatment is more than a matter of filling gaps in her knowledge, although information is important and useful [7,8]. Access to the experiences and support of others is also crucial [9], as are a variety of skills and tools to plan, evaluate and decide, or even to deal with the flood of information in the first place. Of course, individual patients vary enormously in their needs and preferences for specific resources, so there can be no one message suited to all breast cancer patients, and this should make interactive resources much more useful than mass communications (books, pamphlets). The present study experimentally compared four different interventions, each of which had the flexibility to provide the varied resources needed by any particular patient.

1.1. Four interventions

1.1.1. Internet access—It would seem that the combination of a full range of potential resources and control by the user would make the Internet a highly supportive tool for breast cancer patients. Given access in the first place (provided here by the study), time and space disappear as barriers, anonymity is readily maintained, an enormous variety of quality information and tools are available, and the experiences and support of others can be accessed through blogs, stories, bulletin boards and chat rooms [10]. These potentials may be limited, however, by the current state of the Internet for health. The sheer amount of information and sources can be overwhelming, full of redundancies, often apparently contradictory, and replete with self-serving or unscientific claims competing on a seemingly equal footing with scientifically sound resources [11,12]. Thus, although a breast cancer patient could *potentially* benefit enormously from using Internet resources, the barriers could leave its potential unrealized in many cases. In fact, one recent study found patients with access to Internet resources no better off (and perhaps even worse off) than patients given book or audiotape breast cancer resources [13]. Nonetheless, accessing the Internet for health issues is rapidly becoming the default, so providing access here actually approximates a usual-care control condition.

1.1.2. A system of resources—CHESS (the Comprehensive Health Enhancement Support System) is a Web-based system combining scientifically sound information with a

variety of other resources based on input from clinicians, patients, family members, web designers and communication scientists. Resources can be classified in three groups as follows, and are designed to complement each other and together attempt to speak to all the needs of breast cancer patients [14,15].

Reactive information: CHESS contains over a dozen individual services that provide overlapping but differently structured information about breast cancer, its treatment and consequences, dealing with the medical system, and broader life issues. A partial listing illustrates the different styles and formats of these services: FAQs, Library articles, Personal Stories, Resource Guide, Evaluating Web Resources, Calendar, and My Journal. The important shared characteristic is that the system is completely under the user's control. As is the case with much Internet content, the system is in many ways just a varied and readily accessible book, but provides no action of its own. However, the potential advantage of combining them in a system is that individual services point to each other's content, and together they provide information that is trustworthy, comprehensive, and minimally redundant.

Communication: Two components provide the ability to communicate with others. Discussion Group is an asynchronous support group on which fellow breast cancer patients share experiences, provide support, and comment on all manner of topics. A CHESS staff member monitors patient messages daily, and can intervene if messages become hostile or advocacy of 'quack' cures persists. In practice, however, the staff members has almost never needed to intervene; interactions are warm and supportive, and groups self-police about the medical validity of claims. Thus, the Discussion Group feels as though it entirely belongs to participants rather than 'big sister.' Previous research with patients across a variety of health topics has consistently found this service used far more often than any other. A second communication service, Ask an Expert, allows the user to send questions (typically those too specialized to find answers within the Information services) to an NCI-trained Cancer Information Specialist, who answers within 48 h.

Interactive—In several services, the CHESS system takes on the more active role of coach or collaborator. In *Action Plan*, the user plans a behavior change and the system helps her evaluate factors that make her success at that change more or less likely. *Healthy Relating* trains the user (and her partner) to manage the relational stresses brought on by the cancer and communicate more effectively. *Easing Distress* trains the user to use cognitive-behavioral therapy techniques [16] to manage their emotional responses to their cancer diagnosis and treatment. In each of these, the computer provides evaluation and/or has its own agenda and goals that it brings to the interaction.

A major strength of CHESS and comparable programs is that they are indeed systems. Whereas most Web sites provide a single approach to content, forcing a user to browse from site to site to meet different kinds of needs, an integrated system of services meets the varying needs of its users at different times and in different situations. The systems approach not only makes it far easier for users to find what they need, but it may also encourage them to see connections between physical, emotional, and social aspects of their illness, all of which should enhance quality of life more effectively than use of the Internet in general. Several studies have reported CHESS to improve quality of life over control conditions offering books, and one recent study found it superior to both a control and an Internet condition [13–15].

1.1.3. Human Cancer Information Mentor—Implicitly, the gold standard for health communication with patients is the performance of a caring, insightful medical professional with good interviewing skills and flexible time – the sensitivity and responsiveness of

interpersonal communication with full medical expertise. This is obviously difficult to achieve in practice, but two alternatives exist. A number of support systems for cancer patients utilize peer cancer survivors (e.g., Reach to Recovery, Pillars of Hope), who often have reasonable lay expertise with cancer information, but whose main strength comes from the shared experience and often an ongoing supportive relationship. Alternatively, the expert approach is exemplified by NCI's telephone-based Cancer Information Service, which provides individualized, confidential interactions with anyone seeking cancer information. This one-on-one tailored interaction allows for responsiveness to the caller's needs and abilities, can introduce information the caller did not know to ask about, and can help interpret information.

However, not all problems presented by callers can be solved in a single conversation. Callers are encouraged to call back with additional questions or when their situation changes, but speaking with the same specialist is not facilitated, so a second call cannot benefit from memory or the development of an interpersonal relationship. We propose that combining the information and resource expertise of the cancer information specialist with the ongoing contact and support typical of the lay guide/mentor/navigator could produce a powerful intervention. In the present study, a CIS-trained specialist was further trained to be an ongoing Cancer Information Mentor for breast cancer patients. She called each patient 10 times during the 6-month intervention, weekly at first and then monthly at the end. In these calls, the Mentor answered patient questions, but also helped her evaluate the information she got from various sources and suggested further search topics and strategies. The continuity of repeated calls further allowed the Mentor to build on past discussions.

1.1.4. CHESS plus Mentor—We expected substantial synergies from the combination. A woman could read material in CHESS and come to the Mentor better equipped for the encounter. By referring the user to specific parts of CHESS, the Mentor might not need to educate the caller on breast cancer basics and could use their time to address more complex issues. When combined with the depth of resources and additional information about the patient offered by CHESS, the Cancer Mentor should be much more effective. CHESS tracks patients in its database and provides the Mentor basic information about changes in the patient's treatments, symptoms or CHESS use patterns, both immediately and over time. It also suggests other CHESS resources that the Cancer Mentor could recommend to the patient, thus facilitating Mentor efforts to provide access to information.

1.2. Mediating mechanisms

Identifying *how* interventions support people through health crises is crucial to understanding, improving, and generalizing such impacts on people's lives. Given the scale and over-time variability of the crisis posed by breast cancer, the individuality of response to it, and the potential varied richness of each of the interventions here, we think that an overarching theoretical approach to quality of life is necessary, and this is best represented by Self-Determination Theory [17,18]. This theory and its body of research evidence make the case that experienced quality of life is largely a matter of the degree to which three basic psychological needs for autonomy, competence and relatedness are met. Autonomy is the sense that one's actions and experiences are volitional rather than controlled by strong external or internal forces. Competence is perceiving oneself to be efficacious. And relatedness is the need to experience connection to others, in this case particularly those relevant to the disease experience.

Each of these basic needs is likely to be affected by the diagnosis and treatment of breast cancer (e.g., "My life is out of control" (autonomy), "I can't do anything about it" (competence), and "I feel all alone" (relatedness)), which negatively impacts quality of life.

But conversely, each of the interventions utilized in this study has the potential to help with the recovery of all three needs and thus with quality of life as well. Understanding one's disease and treatments (among other things) fosters competence, as does the acquisition of any skills for dealing with self-management or the health care system. The simple use of resources may foster autonomy, but encouraging this is an emphasis both of CHESS and the Mentor. And relatedness will clearly be strengthened by adding a Mentor to one's support, but this is probably true for CHESS and perhaps even the Internet as well. Using such a system, especially if it coaches and collaborates as do the CHESS interactive features, will bring on the experience of both *interactivity* and *presence* [19–21], and perceiving a computer-based resource as an active personal presence adds a resource to one's store of relatedness.

Testing for mediation may be particularly important in this instance, where we are examining data after only 6 weeks of the interventions. Although CHESS has been shown to maintain and enhance cancer patients' quality of life better than usual care or open Internet access (and we expected a human Cancer Information Mentor to be equally or even more efficacious), effects on quality of life tend to take some time to occur, and might not yet be apparent in the data analyzed here after only 6 weeks of the interventions. In one recent study [13], the CHESS advantage over the control group was only significant nine months after the intervention began, which was also four months after the intervention ended. Other effects (on social support) appeared as early as after two months of intervention, and the CHESS advantages over the Internet group included quality of life as early as two months, but it seems clear that the 6-week data reported here should be better for looking at proximal than at distal effects [22].

1.3. Hypotheses

Thus, both for effects on quality of life and for mediation through autonomy, competence and relatedness, we predicted the following, all of which were tested one-tailed:

- H1.** Breast cancer patients randomly assigned to CHESS will be better off than those assigned to the Internet condition.
- H2.** Breast cancer patients randomly assigned to a Mentor will be better off than those assigned to the Internet condition.
- H3.** Breast cancer patients randomly assigned to the condition combining CHESS and a Mentor will be better off than those assigned to CHESS alone.
- H4.** Breast cancer patients randomly assigned to the condition combining CHESS and a Mentor will be better off than those assigned to Mentor alone.

2. Methods

2.1. Participants and procedures

Women diagnosed with primary breast cancer (8% were recurrences) within the last two months were eligible for recruitment at each of three sites: Hartford Hospital (Connecticut), MD Anderson (Texas), and the University of Wisconsin. Doctors or nurses introduced the study to potential participants, and if they agreed, they were contacted by a research staff member who explained that the study intended to compare benefits of different resources for breast cancer patients and described study procedures in detail. Participants then signed a letter of consent approved by the IRB of each institution, completed a survey pretest, and were randomly assigned to one of the four conditions described above (Internet access was included in the other three conditions as well), stratified by site and ethnic minority vs. majority.

Over 80% of those invited elected to participate, yielding 370 who completed both the pretest and the 6-week post-test, nearly evenly divided between the four groups (see Table 1 for numbers randomized and drop outs for each group). All women were loaned a laptop computer (unless they owned one they preferred to use), and their Internet access charges were paid for the 6 months of the intervention (if a woman did not have a phone line, the study paid for telephone service as well). Participants from the Internet-only and Mentor groups were offered training in Internet use (navigation, links, search strategies), usually by telephone, but some preferred in-person or by using a tutorial CD. Training for participants in the CHESS groups averaged about 10% longer, but focused on introducing them to the services available in CHESS. All participants were also given a list of six high-quality Internet breast cancer sites available to the general public.

A toll-free Help-line was operated weekdays by project staff between 8 AM and 4 PM CST to help Internet and CHESS participants with computer use, modem connections and Internet browser. At other times users could leave a voice message. Staff checked messages 7 days a week and responded to users the next business day.

The post-test survey analyzed here was sent to and returned from participants via US mail, and the women were paid \$15 for each completed survey. In addition, the CHESS server collected the URL and time of every page request, and the Mentor recorded information about calls, including coding their content using CIS categories.

2.2. Measures

Quality of life (primary outcome). The World Health Organization Quality of Life (WHOQOL) project, initiated in 1991, aimed to develop an international cross-culturally comparable quality of life assessment instrument. It assesses individual's perceptions in the context of their culture and value systems, and their personal goals, standards and concerns. The WHOQOL-BREF instrument comprises 26 items, which measure the following broad domains: physical health, psychological health, social relationships, and environment [23]. The WHOQOL instruments were developed collaboratively in a number of centers worldwide, and have been widely field-tested. Since these interventions could not affect physical or environmental health, those two subscales were omitted, leaving an 11-item scale comprised of the social and psychological subscales, along with two overall items ($\alpha = .74$).

To create measures of the Self-Determination Theory constructs autonomy, competence, and relatedness, we added z-scores of the following individual measures within each of these three groupings.

2.2.1. Autonomy—Information Overload was measured with a 5-item scale developed by the authors, employing items such as “I was overwhelmed by all the health information I was given” and “I found it difficult to know what information was trustworthy” ($\alpha = .58$).

An additional single item, “I feel that I am in control over how and what I learn about my health,” was also used as a measure of autonomy, and it was combined with the information overload measure (reversed) to create the measure of Autonomy. Although the two together provided a better measure than would have information overload alone, the resulting autonomy measure may suffer as a mediator from relatively weak measurement.

2.2.2. Competence—Cancer information competence ($\alpha = .82$) is measured with a 5-item scale used in past CHESS studies. Items assess the patient's perceived ability to obtain and use health care information they feel they need.

Health care competence ($\alpha = .86$) is an eight-item scale assessing individuals' beliefs that they can positively affect their health.

2.2.3. Relatedness—Bonding. Focus groups with previous CHESS users produced five items reporting how much the women felt a bond with other patients ($\alpha = 0.93$).

Satisfaction with doctor was assessed with two items developed as part of the FACT-B instrument by Cella [24]: “I had confidence in my doctor,” and “My doctor was available to answer my questions” ($r = .51$). The low reliability may limit the contribution of this component to the measure of relatedness.

Interactivity and presence were each measured by four items developed by the authors following from discussions by Lee [19] and Walther et al. [20] Example interactivity items ($\alpha = .84$) include “the resources I used to get information and support about my breast cancer let me be in charge of getting what I needed,” and presence ($\alpha = .95$) included “the resources I used to get information and support about my breast cancer gave me the sense of being watched out for.” The Internet group responded only about the Internet as a resource, but groups who had CHESS or mentor also responded about those interventions (i.e., the group that received both interventions then answered these questions separately for Internet, CHESS and mentor). Where multiple interventions were involved, scores were averaged, so that the resulting interactivity and presence represent the patient's total experience across whatever interventions she had access to.

2.3. Analysis

To test for mediation, we conducted the analyses in stages. For each of the constructs of autonomy, relatedness and competence, we created a single measure by averaging its components. According to the method of joint tests of significance [25,26], the four hypothesized group differences were first tested for each of the three constructs in analyses of covariance, with baseline values of each construct used as a covariate. After this, a test was conducted examining whether the mediator predicted quality of life, controlling for group membership, as well as pretest levels of the variables (two of the four components of relatedness – interactivity and presence – were not measured at pretest, so this control is less complete in this case). If both tests (intervention to SDT construct, SDT construct to WHOQOL) were significant for a construct, it was declared to be a mediator.

Because the first two hypotheses predicted that each of the single interventions (CHESS or Mentor) would have higher scores than the Internet group, and the second two hypotheses predicted that the combination of interventions would score higher than either alone, a post hoc comparison pursued the implied ordinality and tested whether the combined group scored better than the Internet group.

To control for other influences on quality of life and the mediating variables and reduce error variance, all analyses covaried for age, education (a seven-level ordinal measure), minority status (a dichotomy), and the amount of time since diagnosis (in months) at which the 6-week survey occurred.

3. Results

Table 1 presents sample size and demographic information for the four randomly assigned groups. Because random assignment used tables of permutations and blocks were not necessarily complete at each site, there was some initial variation in the numbers of women assigned to conditions, with fewer in the two conditions involving a Mentor. In addition, a few more women dropped out of the Mentor group. Examination of the demographic

characteristics of drop-outs from each group found no notable differences, except that the drop-outs from the CHES + Mentor condition were older (mean = 61 years) and those in the Internet-only condition were younger (mean = 45 years) than those in the other two conditions. Women remaining on study at the 6-week post-test did not differ significantly on any of the other characteristics shown.

Table 2 presents covariate-adjusted (including pretest levels of the outcomes in each analysis) 6-week means for each of the variables used in these analyses. For the WHOQOL, neither the CHES nor the Mentor condition produced higher quality of life than the Internet-only condition. However, the condition in which women received both CHES and a Mentor did score significantly higher than the Internet-only conditions.

Turning to the mediation analysis, for simplicity's sake we first report the second half of the mediation, that between the proposed mediators and quality of life, even though logically this is irrelevant if there are no differences in mediator scores between the intervention groups. The relationships between the mediating variables and quality of life were strong and unambiguous in each case. Autonomy measured after 6 weeks of interventions was related to quality of life ($B = .061$, std. error = $.016$, $p < .001$); competence was related to quality of life ($B = .075$, std. error = $.018$, $p < .001$); as was relatedness ($B = .036$, std. error = $.011$, $p = .002$). Note that because these analyses control for pretest levels of both quality of life and the mediator variable in each analysis, these are not merely saying that these mediators are positively correlated with quality of life. Controlling for pretest levels effectively means that pretest-to-six week *change* in one is related to *change* in the other.

Turning now to the first step in the mediation analysis, there are similar and significant group differences in all three variables. For autonomy and competence, the Internet group is lowest, CHES and Mentor are intermediate, and the combined CHES plus Mentor group highest, although only the two extreme groups are significantly different from one another. For Relatedness, we should first note that the means were more extreme (and the variances larger), in large part because no pretest scores were available for two of the four component measures to covary at pretest. Here, the two extreme groups were again significantly different, but there were also intermediate differences as well. Both CHES and Mentor groups reported significantly more relatedness than the Internet group, and the combined group reported more relatedness than the group receiving CHES alone. The Mentor-only group was non-significantly intermediate between the CHES and combined conditions. Thus, it appears that the mediation of effects of these interventions on quality of life occurs through all three of autonomy, competence and relatedness.

4. Discussion and conclusion

4.1. Discussion

This paper provides an examination of psychological mediating processes in a clinical trial comparing interventions to assist patients maintain and improve their quality of life while they deal with the diagnosis and treatment of breast cancer. Here, all patients received access to and training using the Internet, but randomly assigned patients also received one or both of two interventions, one an eHealth system of information, support and tools (CHES), and the other repeated telephone contact with a Cancer Information Mentor. We hypothesized that both of the interventions would improve quality of life and the mediating variables more than access to the Internet alone, and also that the two combined would be more effective than either alone, because each was designed to build on the other's contributions.

Given the complexity of women's responses to breast cancer diagnosis and treatment, and the variation in these over time, many specific measures of mediation could be proposed, and each could be expected to play a role for some women or at some point in the time-course of the disease. Here we instead pursued a more general approach to mediation, seeking larger key constructs subsuming such individual measures. Self-Determination Theory [17,18] provides such an approach, proposing that needs to experience autonomy, competence and relatedness are fundamental to effective functioning and quality of life.

For the single outcome measure examined in this preliminary paper, the World Health Organization's Quality of Life index, the two interventions taken alone had no impact relative to the Internet-only control group. However, the condition in which women received both a computer-based system of resources (CHESS) and calls from a Human Cancer Information Mentor did produce significantly higher quality of life. Given consistent quality-of-life effects found in past studies of CHESS for breast cancer patients, this may mean that six weeks was insufficient time to see such effects in those two conditions, although it was sufficient for the two interventions together. It would appear that either these two interventions each contribute independently to an effect only visible when the two are combined, or that the combination works to make each more effective. That is, calls from the Mentor may have served to help women interpret CHESS information and focus their use of CHESS. And the information and skills women gained from CHESS may have made them better prepared to benefit from their Mentor conversations.

Turning to the mediation questions central to this paper, each of the three concepts from Self-Determination Theory, autonomy, competence, relatedness, was strongly related to quality of life at 6 weeks, and controlling for pretest levels of each suggests interpreting this relationship as associating change in SDT concepts with change in quality of life. To complete the examination of mediation, scores for the intervention groups on the SDT concepts produced some but not all the hypothesized relationships, but they did mirror two out of three quality of life differences, and thus provided substantial evidence for mediation.

Specifically, the greater quality of life in the CHESS + Mentor condition than for the Internet-only condition is apparently mediated by similar effects on all three SDT concepts. The quality of life difference between the combined condition and CHESS alone is echoed and thus apparently mediated by changes in perceptions of relationships. However, that quality of life for the combined condition was greater than that in the Mentor condition is not reflected in any significant differences between conditions for the mediating variables, although the groups are ordered correctly for each SDT variable.

For relatedness, there are two additional significant differences between conditions (both CHESS and the Mentor scored significantly higher than the Internet-only group, when there is no hint of such a difference in quality of life. Besides the possible explanations for the superiority of the combined condition discussed above, this raises an additional possibility. It may take time for some of the 'proximal effects' of these interventions, such as fresh or improved social connections with family members, fellow patients (through CHESS), or the Mentor herself to accumulate and translate to the 'distal effect' of quality of life [22].

4.2. Conclusion

In sum, combining a computer-based system of information and support with a Human Cancer Information Mentor for newly diagnosed breast cancer patients produced significantly higher quality of life (measured using the WHOQOL) than for patients given open access to and training with general internet resources for breast cancer patients. Mediation analyses indicate that this effect occurs through proximal effects on all three

concepts of Self-Determination Theory [18] by enhancing autonomy, increasing competence, and strengthening relationships.

4.3. Practice implications

Attempts to intervene to improve the quality of life of breast cancer patients (and quite likely those facing other diseases as well) can be more concrete and focused in their efforts by understanding that their eventual goal may be achieved by first supporting patient perceptions of autonomy, competence and relatedness.

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Table 1

Demographic characteristics of study participants. Baseline characteristics for participants: mean and (SD).

<i>N</i> pretested & randomized	Internet only <i>N</i> = 112	Full CHESS Info + support + Coaching <i>N</i> = 111	Mentor only <i>N</i> = 106	Full CHESS + Mentor <i>N</i> = 105
<i>N</i> dropped by 6-wk posttest	4	5	8	5
Age (years)	52.3 (10.2)	50.9 (9.0)	53.9 (10.9)	52.7 (9.4)
Education	4.9 (1.3)	4.9 (1.4)	4.9 (1.5)	5.0 (1.4)
Minority	11%	10%	10%	12%
Uninsured	0%	0%	2%	1%
Live alone	17%	9%	16%	10%
Days since diagnosis	42.9 (25.5)	42.9 (24.8)	48.2 (26.9)	44.0 (27.6)

Note. Response scales were, for Education: 1 = did not complete Jr. High; 2 = did not complete High School; 3 = High School degree; 4 = some college; 5 = Bachelors degree; 6 =some graduate school; and 7 = graduate degree.

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Table 2

Six-week means adjusted for covariates and pretest scores.

	1. Internet only (N = 83)	2. CHES (N = 86)	3. Mentor (N = 78)	4. CHES + Mentor (N = 76)	Significance, <i>p</i> <.05
World Health Organization quality of life Mediators	2.77	2.75	2.82	3.01	4 >2, 4 >3, 4 >1
Autonomy	-.30	-.13	-.06	.26	4 >1
Competence	-.28	-.26	-.17	.19	4 >1
Relatedness	-1.68	.12	.80	1.09	2 >1, 3 >1, 4 >2, 4 >1

Covariates were age, education, minority status, and time since diagnosis at the post-test survey, and also the pretest level of the dependent variable. Means for the WHOQOL are presented in their original 0–4 metric; means for the mediators are z-scores, as these are each composites of several measures, as described in Section 2. Because directional hypotheses were advanced, tests are one-tailed.